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NEW YORK, FEBRUARY, 1914

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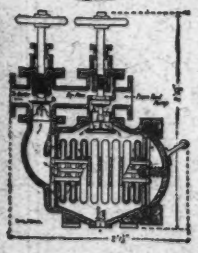

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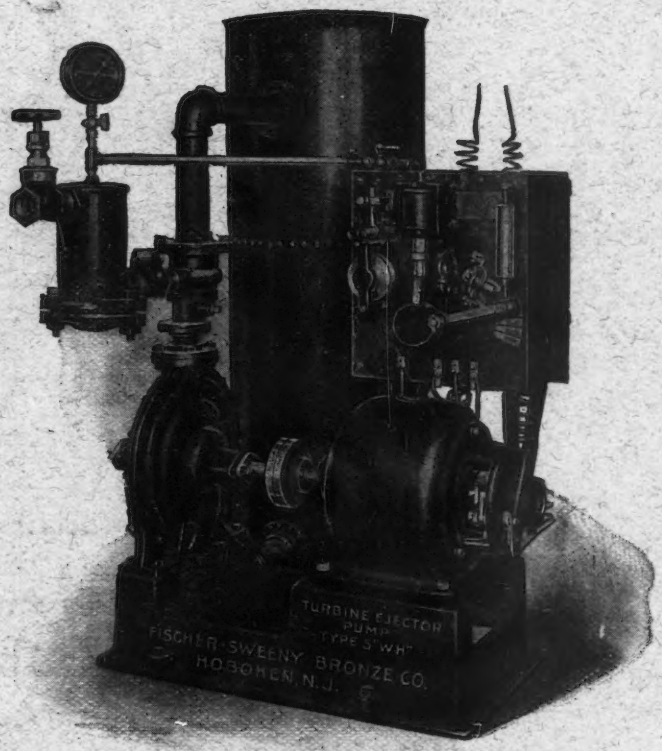

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THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK FEBRUARY, 191

On the Reinspiration of Expired Air

UNIQUE EXPERIMENTS THAT CONFIRM THE THEORY OF THE HEAT ECONOMY OF THE BODY BEING THE IMPORTANT FEATURE IN VENTILATION.*

BY THOMAS R. CROWDER, M.D.

(*Concluded from January issue.*)

If one sits erect and breathes through the open mouth the expired air is thrown directly forward; only the tip of the cone-shaped expansion lies next to the face, and a very slight motion will carry it out of the zone from which the inspired air is taken. Even the slow convection currents are usually sufficient to cause this slight motion within the necessary time limits. This results in there being practically no reinspiration with mouth breathing, unless there is such a change of position of the head as to throw the expired current downward, or unless some obstruction is brought in the way of its forward motion. The facts are well illustrated in Fig. 9. This experiment was made in a room of 3,000 cu. ft. with a temperature of 70°F. The ventilating air came from a hallway and had constantly 5 CO_2 per 10,000. Nasal breathing is represented by the curves marked *A*, and mouth breathing by those marked *B*. The position of the body in the fourth group was that which is usually assumed when seated for writing at a table. The mouth and nasal samples were taken alternately in each of the four groups. Abundant confirmation of these results were noted in other experiments.

Every change of position of the head affects the line in which the expired air is directed. In the normal sitting or standing position (with nasal breathing), as has been previously stated, it is thrown downward, close to the body, and there are more or less constant upward convection currents which tend to bring it back to the face. If the head is thrown well back the air is thrown away from the body, somewhat as it is in breathing through the open mouth, and reinspiration is lessened or prevented entirely.

The effect of such changes can be best studied by assuming the recumbent position and lowering or raising the head. Fig. 10 shows three short series of observations made under these conditions in a bedroom of 1,500 cu. ft. with a temperature of 64°F. While sitting on the bed, propped upright against the headboard, the inspiration was 2.3%; lying down with a pillow tilting the head forward it was 1.3%; when the pillow was removed and the head thrown far back there was none at all.

It is well known that gases tend to adhere to surfaces with which they come in contact. When one lies with the side of the face on a pillow, the expired air is

EDITOR'S NOTE.—Attention is called to the fact that this heading does not appear in Dr. Crowder's original paper and is in the nature of editorial comment. The statement "presented before the American Medical Association" should have read "Reprinted from the Archives of Internal Medicine, October, 1913, Vol. 12, Pp. 420-451." In the complete paper tests were included showing the small amounts of reinspired air when one sits or stands directly between the air inlet and outlet and when the air supply is large. Charts were also included showing the low reinspiration when walking about the room or when leaning over a radiator, contrasted with the larger amounts of air reinspired when standing still.

directed against its surface, and this adhesion will delay its removal from the immediate neighborhood of the face. Furthermore, there is the formation of pockets and dead spaces in the angles which are not easily acted on by convection currents. The softer the pillow, and the more one's head sinks into it, the greater will be the retention. The result of lying in the position indicated is that relatively large amounts of the expired air are reinhaled. This is illustrated by the experiment shown in Fig. 11, made in the same room as the preceding, with a temperature of 60°F. While standing made from 64°F. to 72°F. When sitting in a chair some 8 or 10 ft. from the fire the reinspiration was 1.1% (*A*); lying on a couch, with the face toward the edge and a little removed from it, the reinspiration was 1.4% (*B*); with the face toward the high back of the couch, and some 8 or 10 in. from it, there was 4.4% reinspiration (*C*); while lying on the back, with a very miniature pillow, there was practically none (*D*).

As might be readily inferred from the results of the foregoing experiments, it was found that ventilating currents have less effect on reinspiration in the lateral

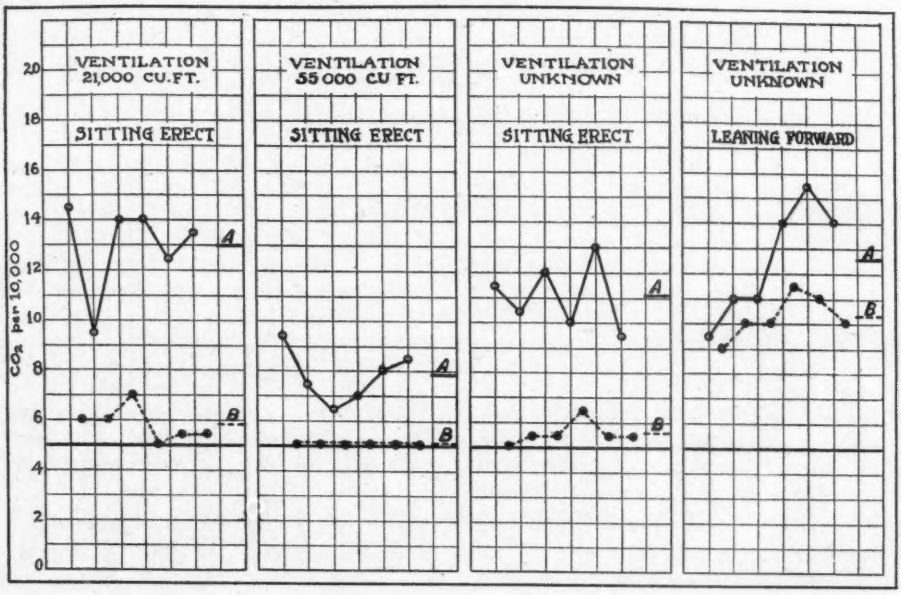


FIG. 9.—(EXPER. 2).—SHOWING THAT THERE IS PRACTICALLY NO REINSPIRATION WITH MOUTH BREATHING UNLESS THE EXPIRED CURRENT IS DIRECTED DOWNWARD, AS IN B AT THE EXTREME RIGHT.
A, NASAL BREATHING; B, MOUTH BREATHING.

by the edge of the bed the reinspiration was 1.2%; lying with the side of the face on the pillow it was 4%; lying on the back with a pillow under the head it was 1%. In this, as in the preceding and in all other similar experiments, there was no obstruction by blankets or other coving. The only effect of such obstructions would be considerably to increase the amount of air reinspired.

The effects of position are again illustrated by the experiment shown in Fig. 12, which was carried out in a large and well-ventilated sitting room, with an open fire-place and a vigorous fire. The temperature rose while the tests were being recumbent position than when the head is free. The adhesion of the expired air and the mechanical obstruction about the face prevent the ready action of such currents in bringing about displacement. The condition is illustrated by the experiment shown in Fig. 13. This was made in a bedroom of about 1,500 cu. ft., where the temperature was 50°F. With closed windows the reinspiration was 2.3% and 3.4% for the upright and recumbent positions, respectively; with an open window admitting air at the rate of $28,000 cu. ft. per hour they were 0.7 and 3.1% respectively.

THE EFFECT OF INCREASING AND DECREASING CO_2

The degree of contamination in the surrounding air has practically no effect on the amount of immediate reinspiration. Any increase or decrease of the CO_2 in the general air of a room is accompanied by corresponding changes in the CO_2 of the inspired air. The gap between the two remains about the same wherever they lie in the scale. It is understood, of course, that these statements apply only when other conditions, such as temperature and air currents, are unaltered. After Lehmann had highly contaminated the air of his laboratory by burning gas, he found about the same difference in CO_2 content between this air and the inspired air that was found on other occasions when the laboratory air was relatively pure.

In order to test the matter in another way, I shut myself in an otherwise empty clothes closet of 175 cu. ft., which could be rapidly contaminated by my own expiration, and made simultaneous observations of the air of the room and my inspired air at five-minute intervals. After ten samples of each had been collected the door was opened and the place thoroughly fanned for ten minutes to renew the air; then six more samples of each were taken at similar intervals, the door being open, the room vacated, and the air agitated during the intervals in order to prevent any reaccumulation of CO_2, but closed while the samples were being taken. The temperature was 78° to 80° F.

During the first period of the experiment the CO_2 of the air of the room rose in a very regular curve from 6.5 to 16.5 per 10,000, and the CO_2 of the inspired air rose in an irregular but corresponding curve a like amount. During the fanning-out process the CO_2 of the air of the room fell to 5 per 10,000, near which it remained during the subsequent tests.

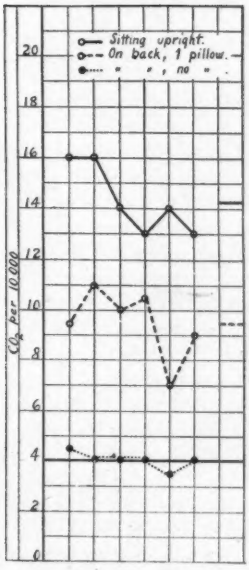


FIG. 10—(EXP. 16). SHOWING EFFECT OF POSITION ON REINSPIRATION.

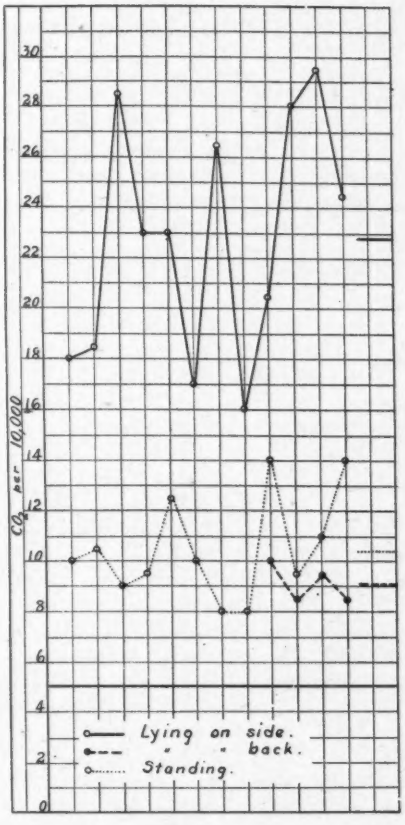


FIG. 11—(EXP. 5). SHOWING THE EFFECT OF POSITION ON REINSPIRATION.

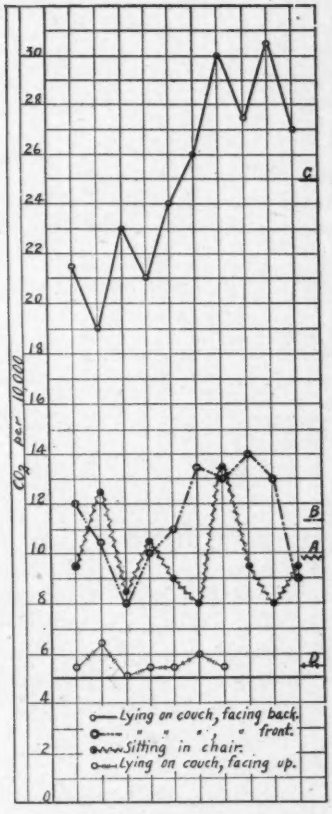


FIG. 12—(EXP. 11). SHOWING THE EFFECT OF POSITION ON REINSPIRATION.

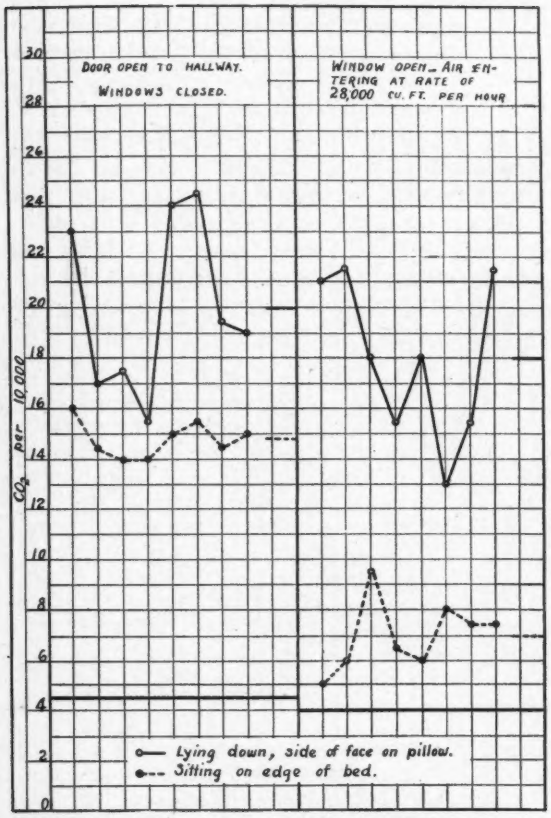

DOOR OPEN TO HALLWAY.
WINDOWS CLOSED.
WINDOW OPEN—AIR ENTERING AT RATE OF 28,000 CU. FT. PER HOUR
CO2 per 10,000
Lying down, side of face on pillow.
Sitting on edge of bed.

FIG. 13—(EXP. 7). SHOWING EFFECT OF POSITION AND CHANGING VENTILATION ON REINSPIRATION.

The CO_2 of the inspired air also dropped back to about the starting point and remained there. These results are shown in Fig. 14. During the first period the average reinspiration was 1.6%; during the second period it was 1.9%.

The results of the first part of this experiment were verified on another occasion under similar general conditions, and in addition to the above, a sample of the air inhaled through the open mouth was taken at each five-minute period.

THE SLEEPING-PORCH AND THE OPEN AIR

From the experiments recorded it is evident that very slight interference with the free movement of air currents about the face is sufficient to prevent the immediate removal of the expired air and to allow contamination of the air we breathe. It was believed that such interference might easily occur in the ordinary sleeping-porch, which is usually built with two open sides, or, sometimes, even in the open air. Investigation of the inspired air under these circumstances was made, and the results found to be in harmony with those previously obtained One does not necessarily breathe pure air because he is out of doors; he is not at all likely to do so under the ordinary conditions of sleeping in tents, tent-houses, or half-open porches, such as are used for therapeutic or hygienic purposes.

An experiment carried out in a sleeping-porch 15x13x8.5 ft. is shown in Fig. 15. The porch has open sides to the south and east, covered by wire screens about 12 meshes to the inch. The temperature was 70°F., and there was a breeze of 400 to 500 ft. per minute in the outside air, varying in direction between south and southwest. The air of the porch, and outside of it, contained 3.5 CO_2 per 10,000, as shown by three successive determinations made in duplicate and indicated on the base line in the chart. This porch contained two beds, one of which stood near the center and opposite a door in the north wall, and one of which was close to the open east side.

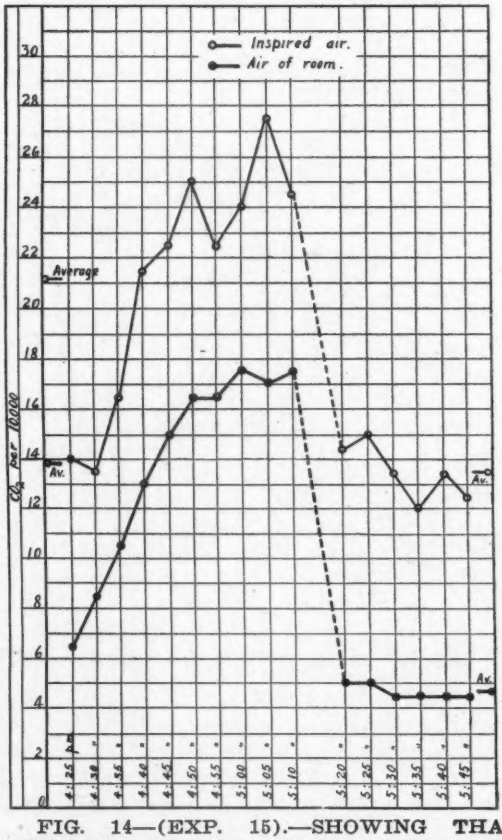


FIG. 14—(EXP. 15).—SHOWING THAT CHANGING THE CO_2 IN THE SURROUNDING AIR HAS PRACTICALLY NO EFFECT ON THE AMOUNT OF REINSPIRATION.

Two series of tests were made: one while sitting on the edge of the center bed (*A*), and one while lying on the other bed with the face about 2 ft. from the screen (*B*). The reinspiration was 0.8%, and 1.1% for the two series, respectively.

Lehmann made four observations in the outside air and found the difference between the CO_2 of the inspired air and

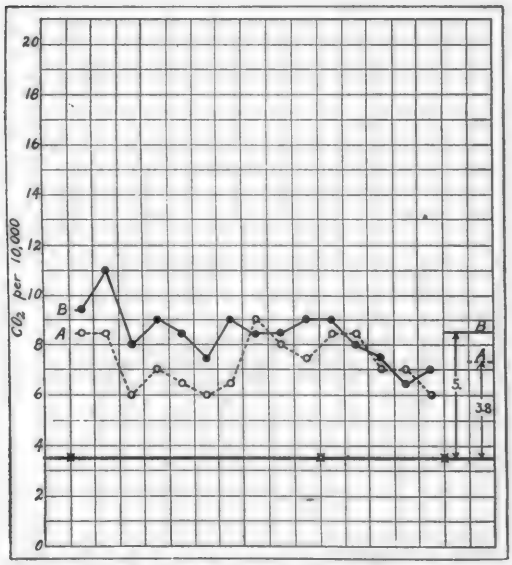


FIG. 15—(EXP. 28). SHOWING REINSPIRATION IN A SLEEPING PORCH WHEN SITTING NEAR THE CENTER (A) AND WHILE LYING ON A BED NEAR THE OPEN SIDE (B).

of the surrounding air to be 0.6, 0.3, 0.8 and 0.0 per 10,000. The difference is so small as to indicate practically no reinspiration. I have made similar findings. The outside air is rarely still, and it moves in great masses. If there is no obstruction the expired air is quickly removed from the breathing zone. If one stands perfectly free there will be no reinspiration, except occasionally on very still days. But it is only necessary to step behind an obstruction of some sort to break up the progressive mass movement of the atmosphere, and the phenomenon begins again. These two conditions are shown in Fig. 16. There was a light breeze blowing and the temperature was 70°F. The curve *A* shows a series of tests while standing well away from any obstruction. Another person was standing only a few feet distant and on the windward side. It is possible that his expired air accounts for the excess of CO_2 in the first three samples of this series. The curve *B* shows a series while seated on an open porch built against the side of the house and opposite to the direction of the wind. The reinspiration is not great, but it is present. The inspired air is not pure, and the experiment serves to show how necessary it is that the air currents be free and unobstructed in order that uncontaminated air may enter the nostrils.

The experiments illustrated and referred to in the preceding represent only such conditions as are likely to be met with in daily life. With the single exception of the closet, the rooms utilized were well ventilated. Many times the air-supply was excessive. The attempt has been made to determine what kind of air is breathed under ordinary and good conditions, rather than what may be breathed under exceptionally bad conditions. It may be fairly concluded that when one

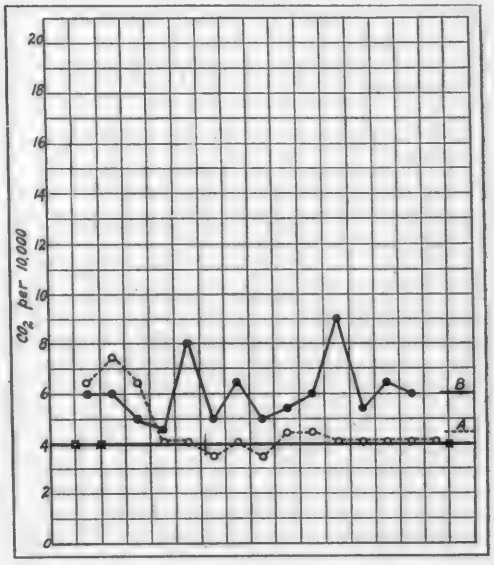


FIG. 16—(EXP. 29). SHOWING THE INSPIRED AIR WHEN OUT OF DOORS. A, STANDING FREE; B, ON AN OPEN PORCH.

lives indoors and remains quiet he will immediately rebreathe from 1 to 2% of his own expired air. When he goes to bed it will be more—from 1 or 2% to 4 or 5%, depending on the position in which he lies. In some of the positions assumed by people sleeping it may even be as high as 8 or 10%; and I have once found it 18% in a single test, which did

not necessitate a position by any means improbable. Nor does sleeping in the open insure pure air for breathing. The same influences here produce the same relative results that they do inside. When one buries his head between pillow and bed-clothes for the sake of warmth, reinspiration is inevitable, and it is not necessarily small in amount.

* * * * *

It is commonly, though erroneously, supposed that the good effects of efficient ventilation are due to the chemical purity of the air. When attention was called to the occurrence of immediate reinspiration it was looked on as a newly discovered source of impurity in the air we breathe. To this previously unrecognized source of contamination was attributed much of the failure that has often attended attempts to bring comfort out of ventilating procedures, and from this has arisen the "theory of displacement" in its application to ventilation.

Accepting the old notion that chemical purity is a proper basis for ventilation standards, and assuming that reinspiration is necessarily harmful, some of the hygienists propose to handle the air supplied to a room in such a manner that the expired air will be immediately carried away from the face and cannot be rebreathed. It is asserted that if the new principle is applied a much smaller quantity of air than is demanded by the older quantitative or dilution standards can be made to yield hygienic results. But small quantities of air do not lend themselves readily to maintaining the currents that have been shown to be necessary in order to accomplish the displacement aimed at. Or, if the neccessary currents are maintained, and throughout a sufficient area to be effective, it becomes a physical necessity to recirculate the air; thus only delaying rather than preventing reinspiration, and reducing the system to one of simple dilution, which it is the avowed purpose to avoid.

By actual experiment I know that the plan most widely heralded does just this thing so far as the contamination of the air of a room is concerned, and it is improbable that immediate reinspiration is materially restricted.

The theory of displacement does not sufficiently take into consideration that all animals possessing lungs ventilate them on a very simple principle of dilution; nor does the pure air theory sufficiently consider that the air of the lungs always remains highly contaminated with their own excretory gases, and that there is such an effective barrier as the dead-space against the lowering of the contamination.

If it is desired to prevent reinspiration, ways have been indicated by which this may be done. The results will be good, bad, or indifferent, according to the plan chosen; but in no case will the result, whether good or bad, depend on the fact that reinspiration is prevented. Within a wide range of variation in the purity of the air we breathe (in so far as the purity is affected by the products of reinspiration), the respiratory function is perfectly adapted to maintain its normal balance. The only apparent effect of rebreathing a little of our own expired air is a slightly deeper inspiration.

But ventilation is not a matter of little consequence because of this. It is still just as important as it has always been considered; the benefits of fresh air and the outdoor life are beyond question. But these measures should be carried out in the interest of the heat economy of the body rather than with regard to the chemical purity of the air we breathe. The good effects of the outdoor air depend on its coolness, its motion and its relative humidity. These physical qualities enable it to absorb the heat which is constantly being formed in the body, and which must be as constantly removed. Air that will take it up rapidly will stimulate healthy functions; air that takes it too slowly leads to sluggish metadolism, and if maintained will ultimately result in a low resistance to disease.

The rigor of a temperate or a colder climate makes of its inhabitants a house-dwelling race. They very commonly over-heat their houses, if not by fire and steam, then by the heat of their own bodies; and when they do this they complain of poor ventilation, regardless of whether the air-supply is large or small. Whichever this may be, under any conditions that are likely to arise, there will still be oxygen in excess of every demand, and the CO_2 will still find a ready escape from the blood; but in an over-

warm atmosphere the body heat will be stagnated and the consumption of oxygen by the tissue cells will be decreased.

Ventilation is necessary in order to maintain the thermic balance of the body and to stimulate its chemical activity; and ventilation with cool air is especially desirable. A little extension of the dead-space beyond the tip of the nose is of no consequence. In spite of this extra contamination of the inspired air, the proportion of CO_2 in the alveolar air will remain a little lower in a warm room than in the invigorating cold of the out-of-doors, as has been shown by Boycott and Haldane. It will remain so because metabolism is reflexly retarded by a warm aerial envelope, the consumption of oxygen by the tissues and the production of CO_2 by them being much less in warm air than in cold.

That this discussion concerning the significance of reinspiration applies only to healthy persons scarcely needs to be added. The capacity of the lungs may become so restricted by disease that the slightest addition to their work is undesirable. But when we learn that they are still capable of performing the respiratory function with the capacity reduced to so little as one-sixth of the normal, the margin of safety is seen to be a very generous one.

A Ward-Cooling Plant In a Hospital

BY A. M. FELDMAN.

(Presented at the annual meeting of the American Society of Heating and Ventilating Engineers, New York, January 20-22, 1914.)

The Mt. Sinai Hospital of New York City is the first hospital, so far as the author has been able to learn, to establish an experimental plant for cooling two small wards, which were used during the past summer in treatment of children suffering from gastro-enteritis. The superintendent of the hospital selected two rooms on the first floor of the children's ward for the purpose in mind. The dimensions of the rooms are 28 ft. x 23 ft. x 11 ft. and 14 ft. 9 in. x 18 ft. x 10 ft. respectively. The author was retained in an advisory capacity and finally designed the cooling plant and supervised its installation.

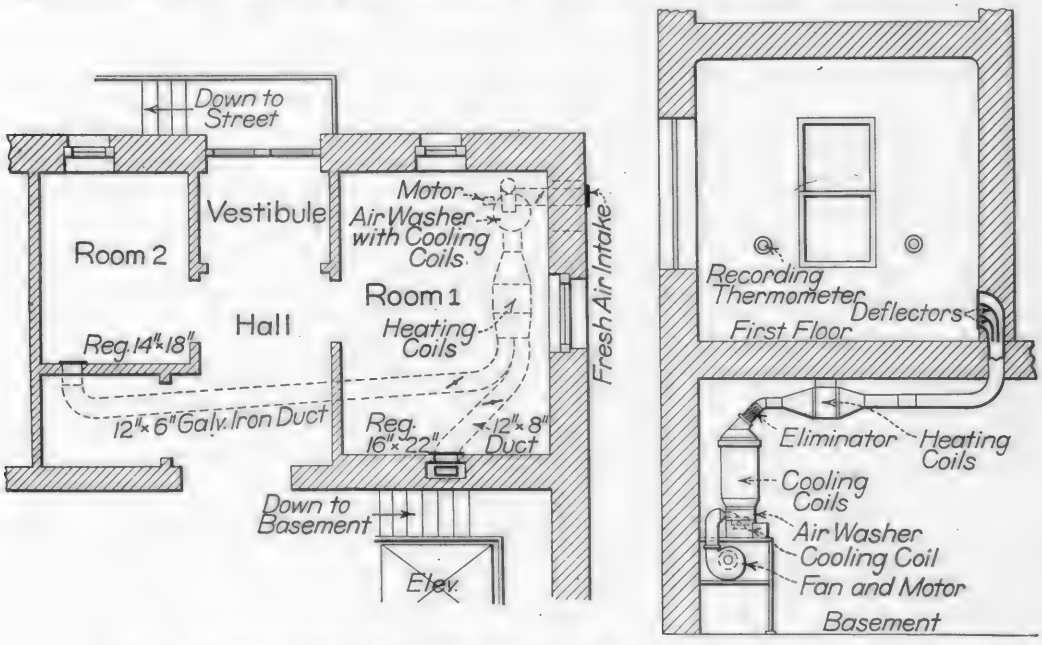


FIG. 1—LOCATION AND DETAILS OF AIR COOLING PLANT.

The cooling plant proper is located in the basement under room No. 1, as shown on plan, Fig. 1. It consists of a Greef air washer, a motor-driven blower and coils through which cold brine is forced, an eliminator for removing the free particles of moisture and heating coils for re-heating the air, if so desired.

In the type of air-washer used, the air is forced through a body of water. A float-controlled valve maintains a uniform water level as the supply water is lost in evaporation. A brine coil of 5 sq. ft. is immersed in the water of the washer, and 66 sq. ft. of additional cooling surface, divided into three sections, is installed in the upper shell. Thus the air is washed and partially cooled by passing through cold water and then by passing over the cooling coils above. Brine is taken from a return main in connection with the refrigerating system of the building, pumped through the coils by means of a small motor-driven centrifugal pump and delivered to the same return.

For the purpose of keeping a record of the condition of the air, two Bristol recording thermometers were installed in the large room, one to register the outdoor temperature, the other the temperature of the room. The relative humidity was ascertained by a sling psychrometer.

The experiments were conducted during the entire summer of 1913. Observations were taken in room No. 1 where three to four children were under treatment. Air was delivered at the rate of 250 cu. ft. per minute. In addition to the temperature of this room, a record was kept of the temperature and relative humidity in the main children's ward where no cooling was done. Typical charts of the recording thermometers are reproduced in Fig. 2, showing the records for the hours from 9 o'clock A. M., July 30, to 9 o'clock A. M., July 31, 1913. The outdoor temperature, as will be noticed, was 86° F. at 9 A. M., rising gradually to an average of 92° F. between 1:30 and 4 P. M., then dropping gradually to 78° between 5 P. M. and 6:30 P. M., when it began to rise again. The indoor temperature of the room was maintained at an average of 72° between 9 A. M. and 3 P. M., rising gradually to 74° at 7 P. M., which latter temperature was maintained until midnight, then rising to 75° until 4 P. M., dropping again to 74° until 7 A. M. and to 72° at 8:45 A. M.

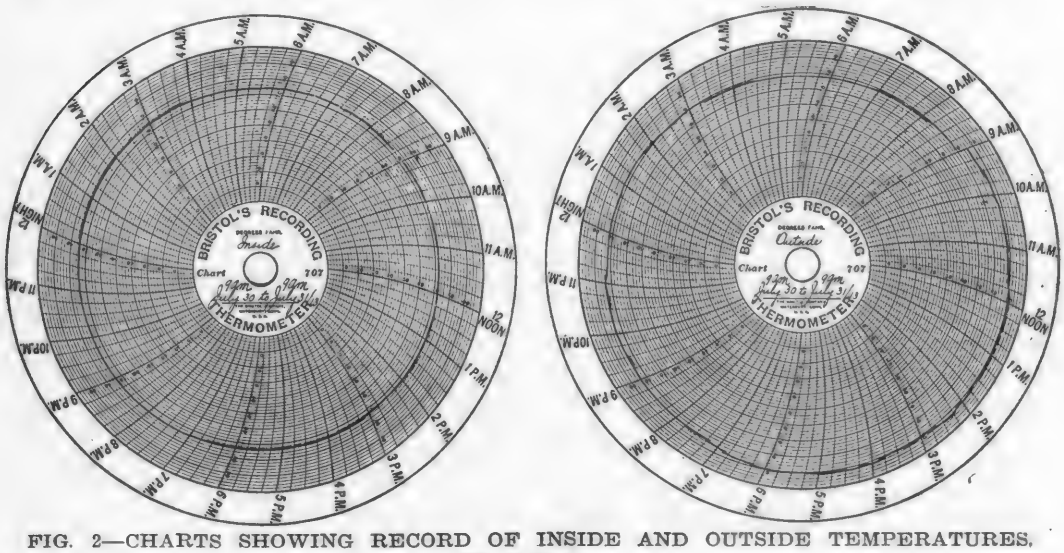


FIG. 2—CHARTS SHOWING RECORD OF INSIDE AND OUTSIDE TEMPERATURES, JULY 30-31.

The relative humidity was observed at different intervals during the day. In the artificially cooled room, the relative humidity varied between 41% and 76%, making an average of 60% for readings taken on 25 different days. In the main ward, the relative humidity varied during the same period from 35% to 80%, with an average of 59%. The temperature in the cooled room varied during the period

of observation from 63° to 74° F. This latter temperature was reached only on one day when the temperature on the street rose to 93° F. The average temperature in the cold room for 252 readings was 69° F. during a period of 42 days. The record of the outdoor temperature during the same 42 days, taken at 8 A. M., 12 M., 4 P. M., 12 M., and 4 A. M., were 77°, 79°, 80° and 70° F. respectively.

It is interesting to note that while low temperatures were obtained in the cold room, the relative humidity was approximately the same percentage as that in the main ward with higher temperature, thus indicating that the absolute humidity was reduced by the process of cooling. As beneficial results were reported, it may be inferred that air conditioning by lowering the temperature and reducing the absolute number of grains of moisture produces the effect, notwithstanding that the relative humidity may still show a high percentage.

As the hospital wanted to experiment with low temperature only no tests were made with re-heating the air as designed.

Effect of Time in Determining Radiation

A METHOD OF ASCERTAINING WHETHER IT IS MORE ECONOMICAL TO HEAT A GIVEN BUILDING CONTINUOUSLY OR INTERMITTENTLY.

BY JOHN R. ALLEN.

(*Presented at the annual meeting of the American Society of Heating and Ventilating Engineers, New York, January 20-22, 1914.*)

The rules usually used in determining the amount of radiation used to heat a building assume that the building is not allowed to cool during the heating season. If there was installed in a room just sufficient radiation to supply the wall, window and diffusion losses and the building should be allowed to cool, then it would take an indefinite amount of time to warm the building. The necessity of warming the building when it has once been allowed to cool is allowed for by most engineers by adding a certain percentage to the radiation determined, assuming the building to be continuously warm. In this paper I propose to show that an expression can be developed which will serve to calculate approximately the amount of radiation necessary to warm a building in a given length of time and also the time required to cool a building to a certain temperature.

Ordinarily it would not be necessary to use such an expression for buildings such as residences, stores and hotels. There is another class of buildings such as schools, auditoriums, churches and factories, which are at times intermittently heated and to which these expressions would apply. This is particularly true with large monumental buildings such as cathedrals where the effects of the heat stored in the walls is very appreciable. The heat stored in structures like the great cathedrals of Europe is of such an amount that no heating system is necessary. Take, for example, the great Mosque of St. Sophie, which is located in a climate where the temperature at times is as low as 20° F. above zero. The heat stored in the heavy walls of this building during the summer is sufficient to keep it warm throughout the winter season.

The effect of the walls of the structure on the heating of a building involves different calculations and a new set of conditions from those usually assumed. There are four principal factors: 1, the heat required to warm the exterior walls; 2, the heat required to warm the interior structure such as windows, walls, floors and furnishings; 3, the heat required to warm the air in the room; and 4, the heat to take care of the heat losses through walls and windows, which will include diffusion, floor and ceiling losses. In order to derive an expression for these terms, let us assume the following notations:

t^1 = the temperature desired in the rooms.
t_o = the temperature outside the building.
t_a = the temperature of the building when cold.
t_w = the temperature of the inside of the outside walls when the building is cold.
t^2_w = the temperature of the inside of the outside walls when the building is warmed.
t^1_w = the temperature of the outside of the outside walls when the building is cold.

t^2_w = the temperature of the outside of the outside walls when the building is warm.
S_1 = specific heat of air.
S_2 = specific heat of stone.
S_3 = specific heat of wood.
S_4 = specific heat of plaster.
W = wall surface, sq. ft.
W_1 = weight of air per cu. ft.
W_2 = Total weight of stone.
W_3 = Total weight of wood.
W_4 = Total weight of plaster.
W_e = Equivalent weight in stone for exterior building structure.
W_p = Equivalent weight of plaster for interior building structure.
G = Glass surface.
G_e = Equivalent glass surface.
n = Number air changes by diffusion.
C = Cubic contents of the room.
K_w = Coefficient of heat transmission for walls.
K_g = Coefficient of heat transmission for glass.
K_c = Coefficient of heat transmission for ceiling.
K_f = Coefficient of heat transmission for floors.

Then by the ordinary rule,—

(1) The heat loss per average hour from the room=

$$(K_wW+K_gG)\left(\frac{t_1+t_a}{2}-t_o\right)$$

Reducing W surface to equivalent glass, $G_e{}^w=\frac{K_wW}{K_g}$

and total equivalent glass $G_e=G+G_{ew}$ and expression (1) becomes

(2) $$K_gG_e\left(\frac{t_1+t_a}{2}-t_o\right)$$

The heat required per average hour to take care of diffusion would be equal to

(3) $$S_1W_1nC\left(\frac{t_1+t_a}{2}-t_o\right)$$

Combining expressions (2) and (3) would give the total heat loss per average hour from the building

(4) $$(S_1W_1nC+G_e)\left(\frac{t_1+t_a}{2}-t_o\right)$$

The building structure may involve a good many different materials and to avoid a very complicated expression, it is better to reduce them all to the equivalent weight in one material. The equivalent weights would be proportional to their relative specific heats, as for example, if a building is composed of wood and stone.

$$W_e=W_2+\frac{W_3S_3}{S_2}$$

If there are more materials, each material would add another term to this expression.

The heat required to warm the outside walls would be

(5) $$S_2W_e\left(\frac{t^2_w+t^3_w}{2}-\frac{t_w+t^1_w}{2}\right)$$

The heat required to warm the inside walls, furnishings and floors not transmitting heat would be, reducing their weight to equivalent weight in plaster W_p.

(6) $$S_4W_p\ (t_1-t_a)$$

The heat required to heat the air in the room would be

(7) $$S_1W_1C\ (t_1-t_a)$$

The total heat to warm the building would be the sum of equations (4), (5), (6) and (7). This expression becomes

(8) $$(S_1W_1nC+G_e)\left(\frac{t_1+t_a}{2}-t_o\right)+S_2W_e\left(\frac{t^2_w+t^3_w}{2}-\frac{t_w+t^1_w}{2}\right)+S_4W_p\ (t_1-t_a)+S_1W_1C\ (t_1-t_a)$$

This expression represents the total heat to warm the building in one hour.

If, however, the building is to be warmed in a certain number of hours h, then expression (8) becomes

$$(S_1W_1nC+G_e)\left(\frac{t_1+t_a}{2}-t_o\right)+\frac{S_2W_e}{h}\left(\frac{t^2_w+t^3_w}{2}-\frac{t_w+t^1}{2}\right)+\frac{S_4W_p}{n}(t_1-t_a)+\frac{S_1W_1C}{h}(t_1-t_a)$$

If the building is allowed to cool after having been heated, then the heat loss (the first term in this expression) may be equated to the remaining terms that will represent the heat given up by the building structure and we have

$$(S_1 W_1 nC + G_e)\left(\frac{t_1 + t_a}{2} - t_o\right) = \frac{S_2 W_e}{h}\left(\frac{t^2_w + t^3_w}{2} - \frac{t_w + t^1_w}{2}\right) + \left(\frac{t_1 - t_a}{h}\right)\left(\frac{S_4 W_p}{} + S_1 W_1 C\right)$$

Solving for h

$$(9)\quad h = \frac{S_2 W_e\left(\frac{t^2_w + t^3_w}{2} - \frac{t_w + t^1_w}{2}\right) + (t_1 - t_a)(S_4 W_p + S_1 W_1 C)}{(S_1 W_1 nC + G_e)\left(\frac{t_1 + t_a}{2} - t_o\right)}$$

Assuming that a building is supplied with an amount of heat, H, per hour, then,

$$H = (S_1 W_1 nC + G_e\left(\frac{t_1 + t_a}{2} - t_o\right) + \frac{S_2 W_e}{h}\left(\frac{t^2_w + t^3_w}{2} - \frac{t_w + t^1_w}{2}\right) + (S_4 W_p + S_1 W_1 C)\left(\frac{t_1 - t_a}{h}\right)$$

$$(10)\quad h = \frac{S_2 W_e\left(\frac{t^2_w + t^3_w}{2} - \frac{t_w + t^1_w}{2}\right) + (t_1 - t_a)(S_4 W_p + S_1 W_1 C)}{H - (S_1 W_1 nC + G_e\left(\frac{t_1 + t_a}{2} - t_o\right)}$$

This expression represents the number of hours required to heat the building when it is supplied with H B. T. U. per hour.

In order that these expressions may be more easily applied, let us assume were reasonable values for the quantities in these equations, as follows:

$t_o = 0$
$t_1 = 70°$ F.
$t_a = 50°$ F.
$S_1 = 0.2375$
$W_1 = 0.077$

If the temperature of the inside and outside air is given then by Rietschel's rule, the temperature of the inside and outside of the wall may be obtained. Let t be the difference in temperature between the wall and the surrounding air, and l the thickness of the wall in feet. Then $t = 16.2 - 4$ and assuming a wall 2 ft. thick, $t = 16.2 - 8 = 8.2$
hence $50 - t = 8.2$ or $t_w = 41.8$
$70 - t = 8.2$ or $t^2_w = 61.8$

and by the same expression
$t^1_w = 8.2$ and $t^3_w = 8.2$
Substituting the above values in equation (9) we get, assuming $n = 1$

$$h = \frac{10 S_2 W_e + 20 (S_4 W_p + S_1 W_1 C)}{1.1 C + 60 G_e}$$

and expression (10) becomes

$$h = \frac{10 S_2 W_e + 20 (S_4 W_p + S_1 W_1 C)}{H - (1.1 C + 60 G_e)}$$

and the expression for large H is

$$H = 1.1C + 60 G_e + \frac{10 S_2 W_e}{h} + \frac{20 (S_4 W_p S_1 W_1 C)}{h}$$

The actual effect of the walls on the amount of radiation can best be shown by applying this expression to an actual case in which

W_e = 5,686,600 lbs.
G_e = 7608 sq. ft.
C = 400,000 cu. ft.
S_2 = 0.21
S_4 = 0.20
W = 10,000 sq. ft.
G = 2000 sq. ft.
W_p = 200,000 lbs.

then the number of hours required to cool the church would be.

$$h = \frac{10 \times 0.21 \times 5{,}686{,}600 + 20\,(0.20 \times 200{,}000 + 0.0183 \times 400{,}000}{1.1 \times 400{,}000 + 60 \times 7608}$$

= 14.4 hrs., or the time necessary to cool the building from 70° to 50° F.

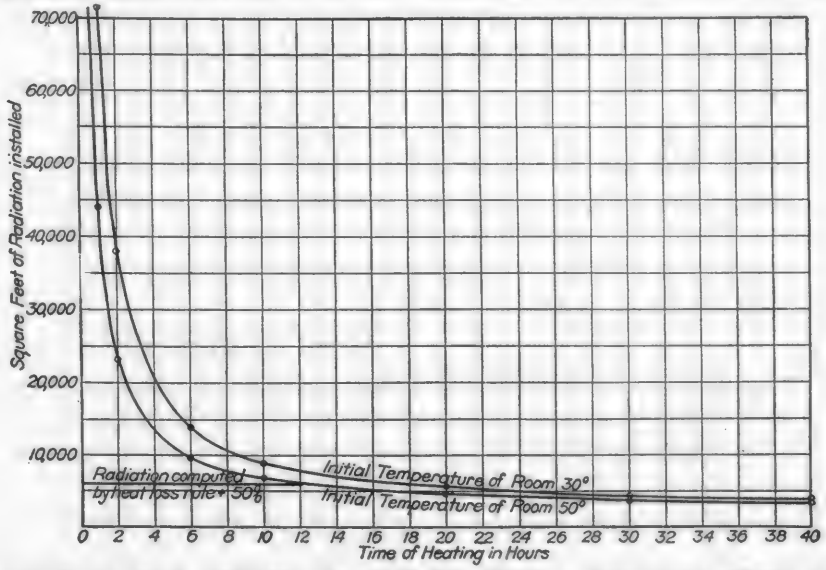
Figured by the usual rule this building would require 4000 sq. ft. of 2-column cast-iron radiation and allowing 50% excess radiation on account of the building's being intermittently heated, the building would require 6000 sq. ft. of radiation. Allowing for average difference of temperature between room and steam, the radiator would give off 300 B. T. U. per square foot per degree difference and the time reuired to heat the building would be

$$h = \frac{10 \times 0.21 \times 5{,}686{,}600 + 20\,(0.20 \times 200{,}000 + 0.0183 \times 400{,}000)}{1{,}800{,}000 - (440{,}000 + 456{,}500)}$$

= 14.3 hrs. will be required to heat the building. If 100% excess radiation had been allowed to provide for intermitten t heating, then the building would have had 8,000 sq. ft. of radiation.

$$h = \frac{12{,}887{,}000}{2{,}400{,}000 - 896{,}500} = 8.6 \text{ hrs.}$$

The effect of increasing the amount of radiation upon the rapidity of heating is shown best in Fig. 1. The curve rises more and more rapidly as time of heating is diminished and the point where this rapid rise commences is about 12 hrs. In a building of this character to attempt to heat the building under ordinary conditions in a short time (anything less than 12 hrs.) means the installation of a very expensive plant. Our ordinary assumption of an additional 50 per cent. added to the radiation gives the time of heating as 14 hrs. which, as can be seen, is a perfectly rational assumption. By means of the equations given it is possible to determine for a given building


70,000
60,000
50,000
40,000
30,000
20,000
10,000
Square Feet of Radiation installed
Radiation computed by heat loss rule + 50%
Initial Temperature of Room 30°
Initial Temperature of Room 50°
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40
Time of Heating in Hours

CURVE SHOWING THE LENGTH OF TIME TO HEAT A BUILDING WITH VARYING AMOUNTS OF RADIATION ASSUMING THE ROOM TO BE HEATED FROM DIFFERENT INITIAL TEMPERATURES TO 70° F.

whether it is more economical to heat a building continuously or to allow the building to cool off and be reheated each time it is to be used.

A Uniform Method for Testing House Heating Boilers

A NEW REPORT CONTAINING THE LATEST PROPOSALS ON THE BOILER RATING QUESTION.

In the accompanying report, submitted to the American Society of Heating and Ventilating Engineers by a special committee on the subject, a further step has been taken in the formulation of a satisfactory plan for testing house heating boilers. That the method proposed is not to be considered final is indicated by the request of the committee for additional criticisms and suggestions. The principal features of the proposed method are presented herewith.

If your committee understands the work laid out for it correctly it would appear that its recommendations should solely apply to a condition for test which has to do with the operation of a specific boiler under conditions approaching as nearly as possible those under which the boiler is to be installed. Therefore, the testing of the boiler for such results becomes a comparatively simple operation compared with the generally accepted theory of boiler test that all relations of one part of the boiler to another should be taken into account, that is, ratio of heating surface to grate surface, proportion of direct surface to indirect surface, etc., etc.

While it is of course possible in testing a boiler to take readings which will allow consideration of varying features of design, it is not intended that this report should deal with such refinement of laboratory tests as apply to design or to set forth a rigid form of test to be applied in all instances without variation. This report, therefore, will have to do with only those items which are essential in the proper rating of the boiler for commercial or sales purposes.

It is recognized that conditions in individual testing stations may be such as to be more practical with one form of apparatus than with another, but it is our hope that we can submit a general plan which will cover the correct principles and will serve the needs in a practical way. We shall therefore confine our remarks to a code for testing boilers which will have for a specific object the determination of the amount of steam which a boiler will furnish when burning a definite quantity of coal per hour for a given number of hours without attention to the fire, and under a fixed condition of draft tension. In other words, this code will cover what we believe to be performance conditions.

THREE SERIES OF TESTS NECESSARY ON EACH BOILER.

It should be borne in mind that a house-heating boiler is generally run under varying conditions. Therefore, any series of tests which are made should take this fact into account and it would seem that to obtain the proper working capacity of a boiler there should be at leats three series of tests made on each. First, one series under maximum draft conditions burning the fuel out in as short a time as possible. Second, one so run as to burn out the fuel in a definite or fixed number of hours, as nearly as possible. Third, one with drafts regulated so that slow combustion rate shall maintain, this slow rate being such as to hold the fire the longest number of hours possible and yet maintain a constant evaporation.

A sufficient number of tests should be made in each series so as to obtain repeated or confirmatory results. The average evaporation per pound of coal based on those tests the rates of which fall between 6 and 10 hrs. duration would in our opinion form a fair or safe average on which to base the working power of the boiler under actual house-heating conditions.

It is of course self-evident that tests with house-heating boilers are of necessity similar in many respects to tests such as are made with power boilers, and therefore to a large extent the methods employed in testing power boilers can be applied to house-heating boilers. In house-heating boilers conditions relating to attendance, cleanliness and method of operation are of prime importance.

It has been the practice for many years for manufacturers of house-heating boilers to rate their boilers on their capacity expressed in square feet of direct radiation or its equivalent, as it is generally desired to estimate the amount of square feet in direct radiation or its equivalent that can be supplied continuously with steam without attention to the boiler for an extended period of time. It is evident that within certain limits the amount of water evaporated per pound of coal would not vary to any considerable extent and within these limits a definite amount of fuel consumed in a short period of time would serve more condensing surface than if the same amount of fuel were burned during a long period of time.

It has seemed to the commitee that in order to have a uniformity in the matter of codes, so far as possible, it would be wise to adopt the general scheme and arrangement as indicated by the American Society of Mechanical Engineers, and, therefore, reference will be made to the code of that society where our suggestions for code precisely agree with the code of that society.

APPARATUS AND INSTRUMENTS.

The apparatus and instruments used in testing should include the following: Feed water tanks calibrated or to be used in connection with weighing scales; air pump, if water is to be fed by compressed air; weighing scales for weighing fuel, ashes, etc.

Differential (Ellison) draft gauges, at least three in number for measuring draft tension, in ashpit, over the fire and in the smoke pipe;

Accurately calibrated thermometers for measuring temperature of escaping gases, feed water, and temperature of steam;

Steam separator for attachment to steam pipe, separator to be thoroughly covered with non-conducting material;

Blanket covering consisting of one-ply 2-lbs. asbestos paper and 1-in. hair felt which would make a desirable covering for the boiler.

Gas analysis apparatus for determining composition of the flue gases (Orsat);

Log sheets on which to keep accurate record of various readings.

The use of the various instruments is very well set forth in the report of the Power Test Committee of the A.S.M.E. and it would seem needless to repeat same in this report.

RULES FOR CONDUCTING EVAPORATIVE TESTS.

Inasmuch as the object of the test is to ascertain the amount of water evaporated per pound of coal fired, all measurements and readings should be taken in such way as to give this result.

The boiler should be set up connected to a suitable chimney flue.

The boiler should be thoroughly boiled out with a solution of sal soda, potassium hydrate, or sodium hydrate and then thoroughly rinsed with clean water to remove any foreign matter.

The piping should be connected in such a way that the steam may be carried to a point away from the boiler and piping arranged so that its condensation may not flow back to the boiler itself.

The separator should be attached to the flow pipe and from the bottom of the separator a pipe should be connected in such a way as to form a water seal and with an open end so that surplus water may be conducted into a pail or barrel for weighing at completion of test.

The piping should connect the calibrated water feeding tanks into the return of the boiler, with all necessary valves and connections, thermometer cups, etc. The water should be fed to the boiler continuously from calibrated tanks, thus showing every pound of water that enters the boiler.

Special care should be used in all readings.

Where weighing tanks are used or water is fed by gravity extra precautions should be taken to avoid error in readings.

Three draft gauges suggested as part of the equipment, should be used to determine pressure loss in the ashpit, pressure loss through the fuel, and pressure loss through the flues of the boiler.

The steam pipe from the boiler should be left open to the atmosphere so that the test can be carried on at atmospheric pressure, as we believe that running a boiler under pressure gives no more accurate results as regards capacity and

efficiency than may be obtained by evaporating the water at atmospheric pressure.

FUEL.

In order that proper comparison may be made between tests, it is recommended that anthracite coal, stove-sized, such as Lehigh Valley, be used. In this connection attention is directed to statements covered by the Power Test Committee of the A.S.M.E.

STARTING.

It is recommended that a preliminary fire be made and the boiler run until such time as water in the boiler steams when the preliminary fire will be dumped, the ashpit thoroughly cleaned, and a fresh quantity of wood placed on the grate and kindled. The test shall be considered as starting at the time of firing this second charge of wood. On this charge of wood shall be placed the coal, which, for measure of comparison, should be stove-sized anthracite. The wood shall be considered as having a heating value equal to 40 per cent. of that of an equal weight of coal.

The weight and temperature of the water in the boiler at the start should be recorded.

Against the boiler should be charged all of the fuel, including the last charge of wood, and at the end of the test the boiler is to be given credit for the unburned fuel and the quantity of water fed to the boiler during the test, less any water thrown out in excess or a quantity represented by the condensation of the pipe and separator.

If water is not brought to the steaming point at the beginning of the test, credit is to be given to the boiler for the heat expended in heating the water contents of the boiler from the initial temperature to the boiling point at the atmospheric pressure at the time of the test.

It is the opinion of the committee that the "running start" in use at many boiler testing plants is not practical in connection with the testing of house-heating boilers. The amount of fuel used in a test of a house-heating boiler is so small compared with the amount used in a power boiler that any slight error in calculating or estimating the condition of the fire at the end as compared with that at the start would lead to a large degree of error in the actual calculation of the results, for it will be conceded that in small house-heating boilers in burning from 10 to 50 lbs. of coal an hour, 2 or 3 lbs. of fuel would make quite a difference in the results, while it would be almost impossible for the eye to determine such a small difference. Further than this it would prevent tests from repeating, that is, in running a series of tests a sufficient number should be made so as to get confirmatory results or until the results repeat very closely.

It is of course to be expected that no two tests will be exactly alike, but within certain limit tests should be conducted until they confirm one another. If there is a great difference between tests it is undoubtedly a sign that either false readings have been made, chimney conditions are not right, or that mistake has been made in calculation.

Readings should be taken at not to exceed 30-min. intervals, while draft and stack temperatures should be taken at 15-min. intervals.

Gas analysis should be made at least every hour to get fair average results.

STOPPING.

When the time set for the end of the test arrives the fire should be dumped or combustion stopped by some other method such as spraying the fire with water. The contents of the firepot when dumped should be placed in tightly covered cans where they may be left to cool.

After cooling, the unburned coal and ash should be separated, the unburned coal weighed and deducted from the total quantity of fuel fed to the boiler. A proximate analysis of the coal should be made in order to determine its various constituents.

The subjects, "records," "sampling and drying coal," "ashes and refuse," "calorific test and analysis of coal," "analysis of flue gases," "smoke observations," "calculation of results," are all covered so clearly in the report of the Power Test Committee of the A.S.M.E. that we would refer to them without extending this report to quote them verbatim.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Twentieth Annual Meeting, New York, January 20-22, 1914

A registration of over 180 members and guests, together with a full and varied programme, were the principal elements that marked the success of the twentieth annual meeting of The American Society of Heating and Ventilating Engineers, which was held at the Engineering Societies Building, New York, January 20-22, 1914. The healthy state of the society was also shown in the membership figures which are now 402, the largest in the society's history. In addition a cash balance in the treasury amounting to some $2,800 was further indication of the present standing of the organization.

SAMUEL R. LEWIS, CHICAGO.
President, The American Society of Heating and Ventilating Engineers.

From the reports presented it was evident that the society is doing some constructive work of the first order and the caution that was shown in the preparation of standards, such as those, for instance, to be comprised in a model compulsory ventilation law, indicated that every effort is being made to see that the society's recommendations, when finally made, will be worthy of the confidence of the public. Incidentally, some idea of the difficulties of perfecting a model ventilating law were brought out in a way that fully justified the further consideration of the matter.

Afternoon Session, January 20.

The meeting was called to order by President John F. Hale. In his address he told of the work done during the year which, he said, was more fully covered in the reports of the other officers and of the council. He expressed the hope that at a future meeting a symposium can be arranged between the manufacturer, architect, contractor and engineer on the subject of methods and trade policies.

Secretary Edwin A. Scott gave an exhaustive analysis of the financial status of the society showing that the expenses for the past year were within the amount represented by the annual dues. He stated that the volume of the proceedings for 1912 was nearly ready for distribution and that work was well under way for the publication of the 1913 proceedings.

Treasurer James A. Donnelly presented his report showing that the balance on hand had been increased from

$1,041.62 on January 12, 1913, to $2,-823.20 for the year just ending.

The report of the council stated that all of the proposed amendments recently submitted to the membership by the council had been adopted. One of the most important of these amendments is one providing for the holding of the professional sessions of the annual meeting outside of New York City, if desired.

President H. M. Hart of the Illinois Chapter read the report of that chapter calling special attention to the success of the plan adopted at the meetings of the chapter of having the subjects taken up in the form of a debate with a certain number of speakers chosen to represent each side of the question. No decisions were rendered, he said, so that no particular systems of heating were endorsed.

The New York Chapter report was read by Secretary Scott and covered the work of the chapter during the past year. The subjects for the remaining meetings of the chapter for the season of 1913-1914 were given as follows:

February meeting: Fan selection.

March meeting: Schoolhouse heating and ventilation.

April meeting: Hot water heating.

Following the chapter reports, the committee on standards presented the code it has formulated for testing house heating boilers. This is given in full on another page of this issue. In connection with the report, Mr. Donnelly moved for the appointment of a committee of five to develop a standard specification for a house heating boiler and, to this end, to confer with the master steam fitters association, architects and engineers generally. This motion was carried.

Heating Guarantee Clause Adopted.

The Committee on Heating Guarantees, through W. M. Mackay, chairman, presented its recommendations of last year to the effect that the designer of apparatus should be considered responsible for the results to be obtained by its use, provided it is installed and operated as designed and intended; and that the contractor should only be held responsible for the installation of the apparatus in the time agreed with material specified, in exact conformity with the design and specification, and such materials and labor as he may furnish in placing the apparatus, and that any guarantee which the contractor may be called upon to give, covering the installation, completion and materials and labor furnished, should not extend for a longer period than one year from the time of completion and permanent operation of the apparatus.

The committee recommended that this clause be expressed in legal phraseology for use as a part of specifications for heating and ventilating systems. This was put to a vote and carried.

President Hale appointed as tellers of election R. B. Hunt, New York, chairman; E. K. Munroe, Baltimore, Md., and A. A. Kieb, New York.

THE NEW NOMINATING COMMITTEE.

The following were elected as the nominating committee for next year's officers: Frank K. Chew, New York; C. F. Newport, Chicago; P. H. Seward, New York; J. I. Lyle, New York, and John D. Cassell, Philadelphia, Pa.

Evening Session, January 20.

The evening session was opened by the presentation of a report on the work of Ventilation Division of the Chicago Health Department by E. Vernon Hill, M.D. Dr. Hill gave details of the many air tests made by the department in theatres and in street cars showing the improved conditions from a bacteria standpoint, that obtained in well-ventilated theatres. In the case of street cars, notably high dust counts were made in air taken in at or near the floor.

At this point the announcement was made by the tellers of the election of the following officers:

THE NEW OFFICERS.

President, Samuel R. Lewis, Chicago.

First Vice-President, Edmund F. Capron, Chicago.

Second Vice-President, D. D. Kimball, New York.

Treasurer, James A. Donnelly, New York.

Managers, Samuel R. Lewis, Edmund F. Capron, D. D. Kimball, James A. Donnelly, John F. Hale, John R. Allen, W. W. Macon, Frank T. Chapman, J. M. Stannard, Frank G. McCann, Frank Irving Cooper and H. M. Hart.

Following the announcement of the result of the election, a report was presented of the committee on legislation for compulsory ventilation. This consisted of a model ventilation law covering such buildings as schools, auditoriums, hospitals, theatres, moving picture shows and similar meeting places. This report was not given out for publication, as it will no doubt undergo further revision as a result of the suggestions brought out in the discussion.

The balance of the evening session was given over to a display of moving pictures illustrating the manufacture of pipe from the ore to the finished product. The pictures were described by Mr. Rowland, of the National Tube Company, and the slides shown were largely of views taken at this company's plant. The operations were shown in logical order beginning with the mining of the iron ore in the Superior district, followed by its shipment in vessels, including the methods for loading and unloading these specially designed ore boats. Its passage to the blast furnaces was portrayed and the pictures then took up the methods of manufacturing butt-weld and lap-weld pipe, including the Spellerized process. The views and lecture were highly enjoyed by those present and added greatly to the interest of the meeting.

Morning Session, January 21.

The extra session called for Wednesday morning to discuss the proposed model compulsory ventilation law prepared by the compulsory legislation committee developed the fact that a considerable difference of opinion existed as to whether the society should specify the requirements only or should take up the question of methods of arranging the apparatus to fulfill the requirements. A report presented by Theodore Weinshank, chairman of the Indiana sub-committee on compulsory ventilation, advocated a code of methods which, he stated, were those comprised in a set of regulations used in Indiana which were expected to become a law within a month.

As a result of the discussion a committee of five members, consisting of S. R. Lewis, chairman; F. I. Cooper, F. L. Busey, J. D. Cassell and V. P. Hill was appointed to take up certain phases of the subject and report at a later session.

This committee handed in a report just previous to the final adjournment in which it expressed its agreement on the following points:

COMMITTEE RECOMMENDATIONS.

A positive minimum supply of outdoor air from an uncontaminated source of 30 cu. ft. per minute per occupant.

A minimum of 15 sq. ft. of floor area per occupant.

A minimum of 180 cu. ft. of space per occupant.

Temperature to be maintained at the breathing line within a range of 65 to 68 degrees Fahr.

Where relative humidity is under control it should be maintained between 40 and 50 per cent. The committee stated that it considered the elimination of dust as of special importance.

As to floor area per occupant in audience halls, a minimum of 4 1-3 sq. ft. per occupant was advocated, exclusive of aisles and public passageways; also a minimum of 80 cu. ft. of air space per occupant.

Under the heading of "Quantity of Outdoor Air," it was recommended that a minimum positive supply of outdoor from an uncontaminated source should be provided in the audience hall at all times while the show places are open to the public, and the quantity of this positive supply of outdoor air shall be based upon a minimum requirement of 1,200 cu. ft. of air per occupant per hour where the so-called diffusion method (downward ventilation) is used. Where the so-called displacement method (upward ventilation) is used, a minimum of 1,000 cu. ft. of air per occupant per hour shall be supplied.

Under "Temperature" the recommendations were that the temperature of the air in the audience hall shall at all times, while the show place is open to the public, be maintained throughout at the breathing line (persons being seated) within a range of 62 to 70 degrees Fahr. (except when the outside temperature is sufficiently high not to require the air supply for ventilation to be heated). The temperature, distribution and diffusion of the supplied outdoor air shall be such as to maintain the temperature requirement without uncomfortable drafts.

DINNER OF THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, HOTEL MARTINIQUE, NEW YORK, JANUARY 21, 1914.

The committee stated that it would make recommendations regarding hospitals and factories and would forward them to the general committee.

Afternoon Session, January 21.

Two papers by A. M. Feldman of New York were presented at the opening of the afternoon session, one on "Cooling Two Rooms in a Country Residence" and the other on "A Ward Cooling Plant in a Hospital."

In the discussion of these papers Dr. Levy of Mt. Sinai Hospital, New York, spoke of the advantages of the treatment of sickness by cold air. He said that beneficial results in this direction have been secured on a large scale in the Philippines. In the treatment of typhoid fever a current of cold air blown over the patient was found better than drugs in reducing the temperature. Dr. Levy said the heating engineers had it in their power to do a work in connection with the reduction of infant mortality through the cooling of the air, that would compare with the boon of pasteurized milk.

Dr. C. E. A. Winslow, chairman of the New York State Ventilation Commission, said that he believed the time would come when there would be cool day and night nurseries located at given points in cities. He cited the papers just presented as evidence of the practicability of cooling the air on a wider scale in homes and hospitals. He also stated that he believed when the sanitarians finally decided on the requirements from a good air standpoint, it will be perfectly simple for the heating engineer to fulfill them.

At this point a report of the committee on standards on "Standardization of the Use of the Pitot Tube," was presented by J. I. Lyle, chairman. This report was accepted by the society as providing definite directions for using the Pitot tube in measuring air velocities through registers.

A paper was then read on "Coefficient of Heat Transmission in a Pressed Steel Radiator," by Professor John R. Allen. The paper contains a comparison of results secured with a cast-iron and a sheet metal radiator of the pressed steel type. In the absence of Prof. Allen, the paper was read by W. F. Verner of the University of Michigan.

The report of the activities of the Massachusetts Chapter were contained in a report read at this session.

The report stated that the chapter had been active in securing a revision of the Massachusetts laws dealing with the heating and ventilation of buildings used for public purposes. The new law has been signed by the Governor and took effect November 1, 1913. However, the chapter does not endorse the interpretation of this law as made by the Massachusetts District Police Inspection Department as to the ventilation of theatres, halls, and places of public gathering, because the law states that "the ventilation in all cases shall be taken off from near the floor level." The new laws and regulations are issued in booklet form and can be obtained upon application. The new regulations dealing with school house construction have yet to be issued, but it is understood that they are on the press. A new State law has also been passed and signed dealing with moving picture booths.

The chapter has also been active in securing new members for the society and no less than eight persons accepted for membership have been nominated by this chapter, a total of over 50% of the chapter's own enrollment.

The report concluded with the statement that the first school in the world for public health officials has been opened by Harvard University this winter under the direction of Dr. Milton J. Rosenau.

This was followed by a report of the representative of the society who attended the International Congress on School Hygiene.

For the committee on schoolhouse ventilation, Frank Irving Cooper stated that extensive experiments in connection with schoolhouse ventilation were under way. At the Massachusetts Institute of Technology the physical properties of the atmosphere were under investigation. The series of experiments on air washers, which were carried on at Harvard and Springfield during the past year, are being continued and additional tests are being made on ozone machines in connection with air purification.

As there was still some time left before the close of the session, one of the papers scheduled for the following day was presented, entitled "Heating Prac-

tice in Sweden," by H. G. T. Theorell, of Stockholm.

Frank K. Chew, speaking to the topic of "Reserve and Research Fund," proposed that a portion of the initiation fees of the members be set aside for such a fund. He also brought up the subject of life membership. On motion these matters were referred to the incoming council.

D. D. Kimball then gave further details of the plans of the New York State Ventilation Commission. He said that the investigations already under way at the City College included experiments in connection with which a complete equipment has been set up to make tests of air supply, air movement, temperature and humidity, experiments in Public School No. 51 in New York (now building) where two rooms will be reserved for the use of the commissions, an investigation of the dust and bacteria problem in buildings and outdoors, and a series of experiments on animals to obtain the effect of different atmospheric conditions. The present staff of the commission consists of nine men. According to the commission's estimate, the next three years will be devoted to experimental work and the ensuing year devoted to a compilation of results.

Thursday Morning, January 22.

The first paper presented at the Tuesday morning session was on "Life of Building Power Plants," by C. M. Ripley. Mr. Ripley presented a review of the plants installed in New York City, previous to 1900 designed by Pattison Bros., of New York, tending to show that the usual allowance of 5% per year for depreciation was too high, since many plants are still in successful operation that were installed between 15 and 20 years ago.

In the discussion of this paper Mr. Reginald Pelham Bolton called attention to the fact that practically no owners actually lay aside a sinking fund corresponding to a calculated depreciation, so that no estimates should be made on a basis of compounded interest. He also showed that many of the old-time plants, while still in operation, were "eating their heads off" in respect to their low efficiency and more especially as regards the large and valuable space they are occupying, which is far more than would be needed by more up-to-date equipment. Looking at the matter from this standpoint, he stated that the 5% estimate was more nearly correct than a lower figure.

Professor John R. Allen's paper on "The Time Element in Determining Radiation," was read by W. W. Macon. This paper is presented on another page of this issue.

Professor Kent suggested that the paper did not consider all conditions, such as the amount of dampness in walls, the amount of water absorbed by the walls and the effect of the wind.

H. M. Hart stated that the average outside air conditions are only about half of the maximum and that this should be considered in making time calculations.

J. A. Donnelly suggested as an interesting experiment the placing of a recording thermometer in a vacant house during winter weather and then comparing the temperatures indoors and outside.

R. P. Bolton said that the effect of the sun on the time element in heating was an important consideration, and that he was obtaining data from which he expected to plot curves showing the relation of the steam consumption for heating purposes to the amount of sunshine.

An exhaustive paper on "Heating Practice in France," by Gustave Debesson of Paris, was read by W. W. Macon. This paper gave a review of the history of the art in France, together with statements of business conditions and methods of the heating trade in France. He gave interesting reasons why German rather than American goods are used so widely in that country, such as the delay often experienced with American manufacturers in making delivery and the lower quality of castings furnished, as compared with the expeditious and painstaking deliveries made by German manufacturers. Mr. Debesson's paper will be printed and sent to the members for discussion at the summer meeting of the society.

In discussing this paper James A. Donnelly stated that the greatest development in heating practice during the past five years had been in the direction of the French methods.

The concluding paper of this session was one on "The Flow of Steam in

Pipes," by W. F. Verner, of the University of Michigan, which contained numerous tables and charts covering low pressure steam flow.

Afternoon Session, January 22.

At the afternoon session a paper was presented on "Heating Practice in German," by H. W. E. Muellenbach, of Hamburg, read from manuscript by the secretary. This paper, on motion, will be sent in printed form to the members for discussion at the summer meeting.

A number of topics were then taken up, including "Standard Specifications for Cast-Iron Radiators," which Mr. Donnelly suggested should be drawn up and made uniform. On the topic of "Experience with Fractional Valves," Mr. Verner asked that data be obtained regarding the drop in pressure of steam passing through fractional valves. Mr. Otis stated that this would be hard to tabulate on account of the fluctuations of the boiler pressure. In discussing the topic of "Experience in Heating Concrete Construction," Mr. Otis instanced a case where a false ceiling specified for the roof of a concrete building had been omitted, resulting in a cold building, while the snow on the roof was melting despite the wintry weather. Mr. Hart brought up the use of metal sash and the liability of increased air leakage.

The society then took up several proposed amendments submitted by Prof. Kent having to do with recent changes made in the society's constitution. The principal change proposed by Prof. Kent was to alter the tenure of office of the council and their election in classes instead of all each year, was not carried and the society will, therefore, continue under the present plan of electing all of its managers each year.

Vice-President A. B. Franlin, who had occupied the chair during this session, then proceeded to the installation of the newly-elected officers. This ceremony was carried out in a way that evoked numerous expressions of approval and appreciation on the part of the members present, and Mr. Chew voiced the sentiment of the members in stating that such a ceremony, which had fallen somewhat into disuse during recent years, was one well worthy of being maintained. He suggested that an installation committee be appointed another year.

The new president, Samuel R. Lewis, then took the chair, and after the compulsory ventilation committee report, already mentioned, had been presented, the meeting adjourned.

Immediately following adjournment, the new council met and re-apointed Edwin A. Scott secretary.

The Society's Annual Dinner.

One of the largest dinners in the history of the society was that given in the Hotel Martinique, Wednesday evening, January 21. The guests overflowed the main dining room into the dancing hall adjoining. Following the custom established at the recent German dinner of the mechanical engineers, the speakers were introduced between the courses and spoke from their places at the different tables.

The retiring president, John F. Hale, acted as toastmaster and introduced as the first speaker Frank K. Chew, who told of the ideals of the founders of the society. Mr. Chew spoke of the progress of the society which, he said, was leading it into vistas which the founders never suspected. He instanced the growth of the compulsory ventilation idea and showed how much work still remained for the society to accomplish in this direction.

Frank Irving Cooper addressed the diners on the influence of the society upon the profession. Mr. Cooper said that the society is intended to be the embodiment of the highest ideals and that it represented the perfect workmen and the perfect plan, together with perfect faithfulness and perfect skill. Moreover, the society is better able to live up to its high ideals, because they are usually respected by the members. The influence of such an organization is not to be measured by time and its members must be willing to wait and work, with the assurance that it is constantly working upward.

H. M. Hart discussed the influence of the society upon the equipment. Mr. Hart stated that as we work with the society our standards naturally grow higher, thus showing the responsibility that accompanies associated effort.

President-elect S. R. Lewis spoke to the toast of the value of the social side of the society. Mr. Lewis declared the most potent word in the English language was "contact." Men attain kindness of character through contact whereby goodness, being an aggressive quality, submerges meanness. In his own case, he said, due to

contact, Chicago has become a home and New York an oasis. "I speak for contact," he concluded, "with its fruits of generosity and better friendship."

Dr. R. Vernon Hill, of Chicago, spoke of the influence of the society upon public health. Dr. Hill declared that the civilized races may soon be expected to spend the major part of their life indoors. It is therefore necessary to reproduce outdoor conditions in our homes, workshops and public buildings. He stated that he disagreed with those who hold that the doctors must say what is to be done. The doctors, he declared, are hopelessly unable to cope with this problem. The question will be settled by commissions such as those already at work, based on laboratory and cabinet tests. Dr. Hill referred to the cabinet experiments now being made by the Chicago Ventilation Commission and poked some good-natured fun at the results already achieved, indicating the danger of drawing conclusions from meager data.

R. W. Pryor, Jr., spoke of the influence of the society upon the new member. Mr. Pryor said that this influence is evidenced by the numbers of new members who had lately been added to the roll. It was coming to be recognized, he said, that such membership puts the hall-mark on the heating and ventilating profession. He emphasized the benefits of the social side of the meetings and voiced the general expression as to the success achieved in this direction during the meeting then in progress.

After the dinner, an innovation was provided in the form of dancing, which was indulged in generally. The party broke up at a late hour, voting the occasion an entire success.

The Entertainment.

Following last year's practice, an entertainment committee, composed of members of the New York Chapter, provided for the entertainment of the ladies, and also carried out the arrangements for the society's annual dinner.

Tuesday and Wednesday afternoons tea was served at the Engineering Society's Building, the hostesses being Mrs. Goodnow, Mrs. W. W. Macon, Mrs. Frank T. Chapman, Mrs. Perry West, Mrs. J. I. Lyle and Mrs. W. H. Driscoll. On Wednesday parties were organized to visit the Franco-American Food Company's kitchen in Hoboken, the laboratories of Colgate & Co. in Jersey City, and the Research Laboratories of the Rockefeller Institute in New York.

The entertainment committee was composed of: J. I. Lyle, chairman; E. T. Chapman, vice-chairman; D. D. Kimball, Frank K. Chew, Perry West, Conrad Kiewitz, W. H. Driscoll, Arthur Ritter, W. F. Goodnow, F. K. Davis and W. S. Timmis.

New York State's Industrial Board

Details of the powers and duties of the Industrial Board of the New York State Department of Health, with a statement of its programme and methods of work, are contained in a pamphlet recently published by the board. After giving the text of the law under which it is operating and an opinion of the Attorney-General of the State regarding its powers, etc., the pamphlet presents the programme of the board as adopted.

This programme provides for eight committees covering the subjects of fire hazards, ventilation and lighting, sanitation and comfort, dangerous machinery, dangerous trades and processes, bakeries and confectioneries, foundries and mines, tunnels and quarries. A member of the board is to be chairman of each committee, the other members of the board to be ex-officio members of each of the committees which will be designated as a "State Industrial Board Committee." The membership of each committee will also include persons qualified to act as advisors in the details of all matters on which the board shall have power to pass rules and regulations. The latter will serve without compensation, with the exception of their necessary expenses.

The chairman of the committee on ventilation and lighting is Pauline Goldmark. "This committee," says the pamphlet, "combines two important subjects, each of which has a body of literature and a considerable number of highly-trained professionai workers engaged in research and in the practice of the two professions of ventilating and illuminating engineering. The standards in both fields are in a formative stage of development, so that care needs to be exercised in the formation of rules and regulations applicable to industrial establishments."

This committee will divide itself into two sections. Serving on the division of ventilation will be physicians, engineers, officials of health departments and representatives of employers, employees, and voluntary organizations interested in the subject. In addition there may be technical experts familiar with the subject of exhaust systems from the manufacturing standpoint. The division on ventilation will recommend measures for the removal of dust, gases, fumes, and vapors, the equalization of temperature, as well as general factory ventilation.

The makeup of the full committee on ventilation and lighting will be announced within the next few weeks.

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AFTER several years' effort to construct a model compulsory ventilation law for presentation to the various legislatures it is becoming apparent that the difficulties involved in preparing a law that will embrace all of the necessary points and, at the same time, meet with the approval of engineers generally, are so many as to render the proposition wellnigh impracticable. Outside of the fact that such a law must be necessarily a lengthy one, if no loopholes are to be left for the crafty owner to evade its provisions, the varying opinions of engineers themselves as to what such a law should cover, add materially to the complexity of the problem. On one hand, for instance, it is felt that a summary of the requirements is the point that should be featured, while others are emphatic in their belief that the requirements are well enough known and that a statement of the methods for fulfilling the requirements is what is needed; where, for instance, to locate the air supply and exhaust openings, what sizes of ducts to install to obtain given results, etc.

While extended discussion has shown the apparent futility of the present plan, it has also shown a way in which the purposes of a model law may be obtained. Instead of giving the text of such a law, the recommendation is that a booklet be prepared which might well be termed, "Suggestions for Compiling a Model Compulsory Ventilation Law." Let the booklet then take up, in order, the various points to be covered, and where varying opinion exists, to present each important opinion. This would give to the law-makers the desired data, for, as has been stated, they may be expected to phrase a bill on the subject in their own way, in any case.

A START in this direction was made at the recent meeting of the heating engineers' society when a special committee expressed its agreement on the following points having to do with a model law:

"A positive minimum supply of outdoor air from an uncontaminated source of 30 cu. ft. per minute per occupant.

"A minimum of 15 sq. ft. of floor area per occupant.

"A minimum of 180 cu. ft. of space per occupant.

"Temperature to be maintained at the breathing line within a range of 65° to 68° F.

"Where relative humidity is under control it should be maintained between 40 and 50%."

These and other recommendations, which will be found on another page of this issue, are to be turned over to a general committee of the society which has already done much painstaking work in this direction.

THE CONSULTING ENGINEER

"The Consulting Engineer" is prepared to reply, in this department, to any questions which our readers may ask regarding problems connected with the design and installation of mechanical equipments of buildings.

25.—Figuring the Yearly Heat Consumption in Different Localities.

QUESTION.—How would the yearly heat consumption of a heating apparatus be estimated if the maximum requirements were known in any case?

ANSWER.—The heat loss by radiation can be determined with fair accuracy, but the loss due to inefficient regulation would have to be estimated. If a hot water system is under consideration, with the temperature of the heating medium carefully varied with the outside weather conditions, or if, in the case of a steam system, automatic heat control is provided and kept in service, the percentages of the load for weather below the maximum requirements can be determined with reasonable accuracy. If steam is used at a constant temperature and radiators are not turned off with opened windows, the increase will be about 25% of the requirements in the case of hot water or steam with automatic heat control. This increase will have to be estimated from a knowledge of the conditions governing any particular case.

In any heating or power work, where it is necessary to figure fuel consumption, a chart giving the number of hours each 10° F. period occurs in any district will be found to be of great assistance. The United States Weather Bureau will furnish free on application tabulations for each month, showing the maximum and minimum daily readings for any district where there is a station. These records, in most cases, have been kept for several years, so a typical winter can easily be obtained. It will be found that the maximum and minimum daily temperatures occur at nearly the same hours each day. This information can also be obtained from the forecaster in charge of the station. The tabulation shown in the accompanying table (Table I) was made from the Scranton, Pa., district. In that locality the maximum temperature occurred at 2 p. m. and the minimum at 6 a. m. It may be added that the data contained in the table (Fig. 1) were obtained by pasting together recording thermometer charts giving the days of the week to correspond with the calendar. Day periods were assumed at 10 hours each and night periods at 14 hours. These spaces were indicated on the charts by different colored tints. The weather bureau records were then plotted, the maximum and minimum readings being placed under the proper hours. This arrangement gives a continuous plot of the temperature for each month. Lines were drawn through the average for each interval of time, dividing the 10 and 14-hour periods in half where wide fluctuations of temperature occur. The periods of time in hours are then read off from the straight lines, showing the averages and the total hours added, as shown in Table 1.

By taking certain percentages of the maximum load, depending on the outside temperature, and multiplying by the hours for each period, the night, week day and holiday heating can be determined. In this particular chart Saturday afternoon was con-

Outside Temperature, Deg. F.	Ratio	Per Cent. Maximum Load	Hours			
			Week Days		Holidays	
			Days	Nights	Days	Nights
—5	75:75	100	...	...	...	...
0 to 10	65:75	86 2/3	5	42	10	21
10 to 20	55:75	73 1/3	95	175	15	49
20 to 30	45:75	60	320	420	70	203
30 to 40	35:75	46 2/3	465	605	185	350
40 to 50	25:75	33 1/3	400	549	130	253
50 to 60	15:75	20	260	161	60	70
			1,545	1,952	470	946

TABLE 1. NUMBER OF HOURS FOR EACH 10 DEGREE PERIOD OF TEMPERATURE FROM 0 TO 60 DEGREES, SCRANTON, PA., DISTICT.

Month	Week Days. "A" Days. 7 a.m. to 5 p.m. 0°–10°	10°–20°	20°–30°	30°–40°	40°–50°	50°–60°	"B" Nights. 5 p.m. to 7 a.m. 0°–10°	10°–20°	20°–30°	30°–40°	40°–50°	50°–60°
Oct.	...	...	...	30	100	100	...	...	...	35	204	63
Nov.	...	...	...	105	85	30	...	...	14	143	98	14
Dec.	...	5	80	95	40	15	...	...	126	126	49	...
Jan.	...	20	95	95	15	5	14	63	119	77	21	...
Feb.	5	70	80	45	10	5	28	105	56	35	14	...
March	...	...	55	65	70	35	...	7	70	119	79	28
April	...	...	10	30	80	70	...	...	35	70	84	56
Total	5	95	320	465	400	260	42	175	420	605	549	161
	(1545 hours)						(1952 hours)					

Month	Holidays and Sundays "C" Days. 7 a.m. to 5 p.m. 0°–10°	10°–20°	20°–30°	30°–40°	40°–50°	50°–60°	"D" Nights. 5 p.m. to 7 a.m. 0°–10°	10°–20°	20°–30°	30°–40°	40°–50°	50°–60°
Oct.	...	...	...	15	25	10	...	...	...	28	49	21
Nov.	...	...	...	25	40	10	...	...	14	63	63	21
Dec.	...	5	25	20	20	...	...	14	42	42	35	...
Jan.	10	...	10	55	5	...	14	14	35	70	7	...
Feb.	...	10	25	35	5	...	7	21	84	56	...	...
March	...	...	10	25	10	10	...	...	28	56	22	...
April	...	...	...	10	25	30	...	...	...	35	77	28
Total	10	15	70	185	130	60	21	49	203	350	253	70
	(470 hours)						(946 hours)					

TABLE 2. NUMBER OF HOURS FOR EACH 10 DEGREE PERIOD OF TEMPERATURE FROM 0 TO 60 DEGREES, NEW YORK DISTRICT.

Month	Week Days "A" Days. 7 a.m. to 5 p.m. 0°–10°	10°–20°	20°–30°	30°–40°	40°–50°	50°–60°	"B" Nights. 5 p.m. to 7 a.m. 0°–10°	10°–20°	20°–30°	30°–40°	40°–50°	50°–60°
Oct.	...	...	...	5	35	85	...	...	...	...	56	140
Nov.	...	...	...	90	105	20	...	...	...	168	105	14
Dec.	...	25	100	80	20	...	...	70	175	28	14	...
Jan.	...	10	60	135	25	...	28	14	84	161	14	...
Feb.	10	15	40	95	35	15	14	28	70	105	28	21
Mar.	...	...	5	90	90	55	...	...	21	168	84	49
April	...	...	...	5	35	155	...	...	...	14	133	154
May	...	...	...	...	5	100	...	...	...	...	28	154
Total	10	50	205	500	350	430	42	112	350	644	462	532
Per Cent.	0.19	0.99	4.07	9.94	6.95	8.54	0.83	2.23	6.95	12.8	9.2	10.6

Month	Holidays, Sundays "C" Days. 7 a.m. to 5 p.m. 0°–10°	10°–20°	20°–30°	30°–40°	40°–50°	50°–60°	"D" Nights. 5 p.m. to 7 a.m. 0°–10°	10°–20°	20°–30°	30°–40°	40°–50°	50°–60°
Oct.	...	...	...	...	10	30	...	...	...	28	21	63
Nov.	...	...	...	35	45	...	...	...	...	119	14	...
Dec.	...	...	15	45	10	15	...	...	56	70	14	...
Jan.	...	...	5	25	35	15	...	...	7	10	56	...
Feb.	...	5	40	25	...	...	14	14	84	...	14	...
Mar.	...	...	...	5	35	15	...	...	...	...	42	70-
April	...	...	...	...	10	40	...	...	...	...	70	42
May	...	...	...	...	...	25	...	...	...	...	28	28
Total	...	25	110	110	130	110	14	77	164	217	189	203
Per Cent.	0.5	2.19	2.19	2.58	2.19		0.27	1.53	3.26	4.3	3.76	4.04

Total..... 1545 hours 30.68 per cent. 2142 hours 42.6 per cent. 485 hours 9.65 per cent. 3491 hours 69.32 per cent. 864 hours 17.16 per cent.

sidered a holiday and Sunday as well. The regular legal holidays were also indicated as shown by the calendar.

This table of hours is of service in estimating power. If a school is under consideration with 6-hour sessions, as the day periods are 10 hours each, 0.6 of the day periods will give the number of hours the school is in session during the heating season. By taking the total hours of each temperature period and dividing by the total, the percentage of time for each temperature period can be determined for the season.

After the hours for each temperature for each month are determined they can be totaled in the columns as shown. If the maximum heating load occurred at —5° F., with a room temperature of 70° F., the total difference would be 75° F. The percentage of the maximum for each temperature period will be as follows:

The foregoing is only intended to give the method and can be modified by any individual for his particular use, but a chart of this character would be valuable to any central heating station manager. If desired, the periods could be doubled or arranged for each 5° interval, instead of 10°.

If an industrial plant were under consideration the period would be 1,545 hours when exhaust steam could be utilized, while night and holiday heating would be 1,925 + 470 + 946 = 3,368 hours, or a total of 4,913 hours for live steam operation.

The writer has made a similar tabulation for the New York City district. The total season is 5,036 hours. There were found to be 1,545 hours for day heating, or exactly the same as for the Scranton district, although the minimum temperature is a few degrees lower in the Scranton district. In tabulating the hours, all temperatures below 60° F. are excluded, whether they occur in December or April. The New York results really showed 136 hours longer heating season than Scranton. There were a greater number of hours for the higher temperature periods.

COOLING A RESTAURANT.

Equipment of the Schwoerer Lunch Room, Philadelphia, Pa.

From the standpoint of equipment making for comfort and health of patrons and employees, the lunch room of R. D. Schwoerer,

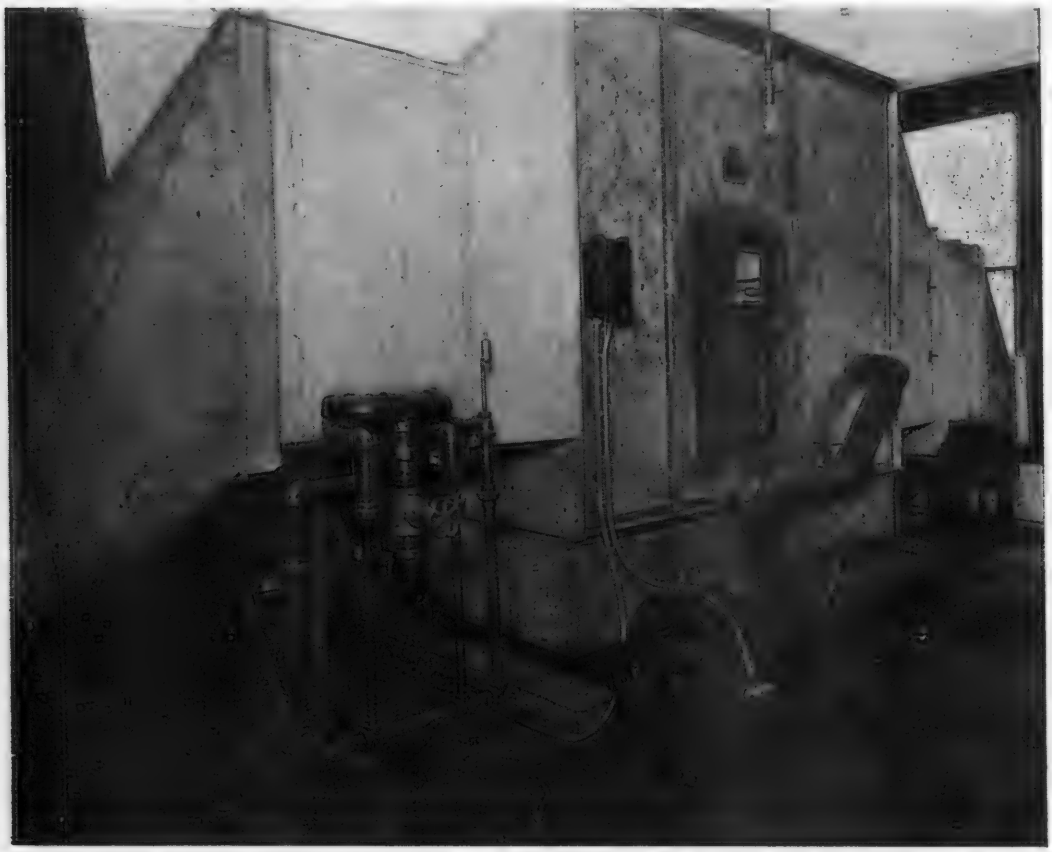
LUNCH ROOMS OF R. D. SCHWOERER, 6 MARKET STREET, PHILADELPHIA, PA.

6 Market street, Philadelphia, has many interesting features. The application of air conditioning apparatus in connection with a mechanical system of ventilation was the means for overcoming difficulties experienced for nearly 40 years. The success of the system demonstrates the practicability of installing air conditioning apparatus in small establishments of this character.

The lunch room, one of the oldest and best known in the city, is on the street floor of an old 4-story brick building, where pedestrian and street traffic is very heavy. The room has a street frontage of 42 ft., with a 25-ft. depth; two-thirds of the area is arranged for serving 38 persons at counters, and the remainder is equipped with tables at which 30 persons may be served. The basement and part of the second story are used for kitchen purposes. In the second story are also located the offices of the owner and the apartment of the assistant manager.

A large refrigerator for storage of meats, etc., is built beneath the sidewalk and opens into the basement. At present a nearby cold storage plant with a brine system in the street furnishes refrigeration for this, as well as a number of individual refrigerators beneath the counters on the main floor, containing milk dispensing apparatus and the like.

Recently the room was refitted throughout and equipment of the most approved type was installed. Extreme care was taken to insure the sanitary storage of food pending its dispensation. Mirrors in the walls and opal glass ceiling, counters, etc., with nickel trimmings afford a clean and tasteful finish. Semi-direct lighting is used.



AIR CONDITIONING APPARATUS INSTALLED IN LUNCH ROOMS OF R. SCHWOERER. SHOWING DRIP PAN UNDER AIR WASHER TANK FOR RECEIVING CONDENSATION DUE TO DIFFERENCE IN WATER TEMPERATURE IN THE TANK AND IN ATMOSPHERE SURROUNDING APPARATUS.

VENTILATION OF THE LUNCH ROOM AN OLD PROBLEM.

The matter of ventilation had always been one of difficulty. Ten large nickel-plated fans of the oscillating type were disposed at intervals around the room, so that they would blow directly into the faces of persons at the counters. Their failure to give relief may be readily understood when the conditions are outlined. The room has always been the

INTERIOR VIEW OF SPRAY CHAMBER, SHOWING BRINE COOLING COILS IN TANK.

object of particular attack by the clouds of dust which traffic causes, augmented by the gusty winds prevalent in the locality. The broad frontage and shallow depth make this more serious.

In Summer the heat reflected through the all-glass front, from the buildings opposite and the paved street, coupled with the heat and odors arising from food and perspiring people multiplied the discomforts that had to be endured in order to avail oneself of the excellent menu and low prices. Obviously, the stirring of the air by means of fans could hardly be expected to give the results desired. After this failure a careful analysis of conditions was made with a view to finding a way out of the difficulty. The mere forcing in of fresh air would only aggravate the dust nuisance. It was, therefore, decided to install an air washer and mechanical ventilating system which would not only furnish large volumes of clean fresh air, but in Summer would afford a substantial reduction in room temperature. To further accentuate the cooling feature, the air washer was arranged for the application of refrigeration.

The installation was made as the accompanying illustrations indicate. It was necessary to put the apparatus all in the second story because of the lack of available space elsewhere. Air is taken through the lower half of one of the second story windows fronting on the street, passes through a tempering coil where it is warmed in Winter sufficiently to prevent freezing the air washer. After having passed through the washer the air enters the reheater where it is warmed to room temperature in Winter; passing into the fan the air is delivered to the various room outlets. Heating is accomplished by direct radiation.

The normal capacity of the air washer is 5,000 cu. ft. per minute. By-passes over the heater coils and speed control of the fan motor admit of a 25% increase in air volume during very hot weather. The normal air volume is twice that considered satisfactory for the number of people to be supplied.

The air washer is that known as the "Type A," manufactured by Warren Webster & Co., Camden, N. J. It is 7 ft. high, 3 ft. 9 in. wide, 7 ft. long, and consists of a casing enclosing a series of mist nozzles for atomizing the spray water, a tank into which the water falls and is recirculated by means of a centrifugal pump with direct connected motor, and an eliminator for removing all free moisture from the air before it leaves the air washer.

The casing, tank and eliminator are built of heavy gauges of galvanized American Ingot Iron, braced with galvanized angles. Access to the spray chamber is obtained by means of a glass panelled cast-iron door and frame. The production of the spray is secured by means of a galvanized header, risers from which are taken off at uniform intervals. Into these risers Webster mist nozzles are screwed and spaced so as to insure a uniform distribution of spray. The nozzle is in three parts—the base which screws into the riser, the spiral cored interior and the cap which screws into the base. The cap terminates in a 3/16 in. orifice from which the spray issues. The water passing through the two spiral passages is given a rotary motion. This, coupled with the interference of the two jets in the throat of the orifice, causes atomization.

An extra large water volume is used in this installation in order to effect economies in the use of refrigeration. The maze of mist with which the air comes in contact removes all dust, filth and odors of the street. The eliminator into which the mixture of spray and air passes to be separated, consists of a series of V-shaped horizontal baffles, two stacks deep and on generously large vertical centers to insure low resistance to the passage of air. The baffles are provided with lips to stiffen them and also to increase the separating efficiency; they are inclined slightly from the horizontal so as to drain to a vertical gutter which conducts the water into the tank.

In the tank is placed an automatic ball float valve for maintaining the proper water level by controlling the admission of fresh water, an overflow to sewer, and a double box brass

strainer covering the outlet to the pump suction so as to prevent foreign matter from getting into the nozzles and piping.

ARRANGEMENT FOR COOLING THE WATER.

For cooling the water there is placed within the tank 2 coils of 2 in. pipe, each 4 pipes wide and 6 pipes high, on 3¼-in. centers, made up with semi-steel split return bends. The coils are valved separately and are suitable for either ammonia or brine. They have a capacity of 20 tons of refrigeration per day. One half of the pipes are submerged, a Baudelot effect being secured on the upper half by reason of the spray water falling on them. Division plates in the tank secure increased length of water travel and higher velocity thereby adding to the efficiency of the coils.

ing and the lightness of the floor construction.

The fan is a motor driven Sirocco of the American Blower Company's manufacture. Speed control of the driving motor permits of regulation of air volume from the maximum requirement in summer to the minimum in winter. The winter service of the apparatus will consist only of conditioning the air for ventilation.

AIR INLETS IN CEILING.

Air is introduced through the ceiling near the rear of the room, is deflected against the rear wall and works toward the street entrances which serve as vents. There are three ceiling outlets in the lunch room, each fitted with a quadrant damper and lock, and

INTERIOR VIEW, LUNCH ROOMS OF R. D. SCHWOERER, SHOWING FRESH AIR INLETS IN CEILING, WITH ADJUSTABLE DEFLECTORS.

The pump for circulating the spray water is of the Platt Iron Works manufacture, and is direct connected to a Westinghouse motor. Pump and motor are mounted on a single base plate, with oil rim around same.

The air washer rests on I-beams set in a special drip pan extending under the entire apparatus, with a drain to sewer, so that any condensation of moisture occurring on the outside of the apparatus by reason of the lower temperature within, would not fall on the floor.

This pan in turn rests on 2 x 4 ft. timbers. Special precautions had to be taken to prevent vibration from the fan and air washer pump owing to the fragile nature of the ceil-

an adjustable diffuser. The efflux of air from the street entrances is sufficiently strong to prevent the entrance of dust carried by the wind. An air change once in slightly more than three minutes is obtainable in the lunch room. This insures sufficiently rapid circulation, so that the oscillating fans are not required, though they may be used when desired.

The air volume was figured on the basis of the heat gain within the room and its absorption, so as to maintain a definite room temperature under extreme summer conditions.

In order to get air into the basement, an old chimney flue was utilized to good ad-

vantage. There are also outlets in each room in the second story.

As installed the apparatus is capable of reducing the room temperature from 10° to 15° below the outside, which, with the low dew point, makes a very agreeable atmosphere. The complete absence of any odors was one of the most marked benefits secured. The owner is contemplating the installation of an oil engine-driven electric power plant and refrigerating apparatus in the near future, which will effectively lower the cost of lighting, ventilating and refrigerating his establishment.

Bower Bros. & Co., Philadelphia, were the contractors.

LEGAL DECISIONS

Is There a Standard Temperature for Heating Buildings?

In an action by a lessor for rent, in which the defense was set up of a breach of a covenant to heat the premises, which consisted of offices, an expert witness for the plaintiff was asked these questions: "What is the standard temperature of offices that are required to be heated?" and "What is the standard temperature of office buildings?" The trial court sustained an objection to each, stating "There is no standards." The degree of heat to be furnished was not specified in the lease; but, on appeal, the court held that the only fair construction was that the plaintiff was to furnish sufficient heat for the contemplated use. It would not do to say that any degree of heat would satisfy the requirement of the contract. It would be equally unreasonable to hold that an excessive amount could be demanded by the tenant. There is also a difference in the degree of heat required by different persons to produce comfort, and is the requirement for an office and for premises occupied for other purposes. There must, therefore, be some measure or test to apply to the covenant to determine whether it has been observed. It must be the degree of heat generally recognized and approved by the class of persons engaged in that particular business, or, what is probably the same thing, the amount of heat to make him comfortable, required by the average person occupying such a building for a similar purpose. The witness had testified, but the testimony was stricken out by the trial court, that the standard temperature was about 70° F. There would probably be no dissent from this; and unless the court was to take judicial notice of it, as a matter of general notoriety, the appellate court thought the answer of the virtues should have been allowed to stand.—Whitney vs. Aronson, (Cal.), 130 Per. 700.

Guaranty for Supplies by Corporation—Validity.

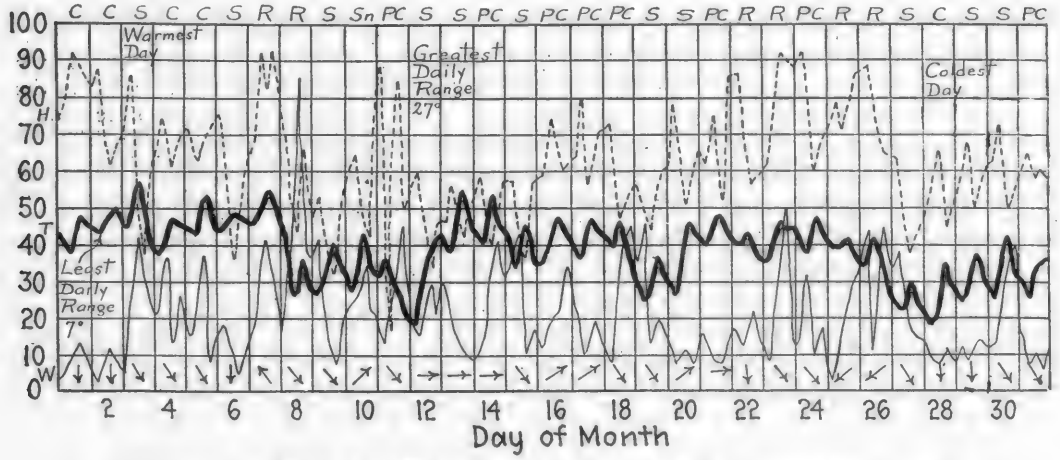
A private corporation engaged in the construction of a hotel building made a contract with B., whereby B. agreed to furnish the labor and materials for the installation of a heating plant, etc. The corporation transmitted to a company to whom B. had applied for supplies a letter, signed by the hotel company's president and secretary informing the company to which B. had applied of his being awarded the contract, that he had placed his order for material with that company on terms that he was to pay 60% of the bills on delivery and balance in 60 days, and stating that the writers were prepared to meet such terms with B., so that the company would be perfectly safe in shipping material to him. The company furnished the material on the strength of the letter, and B. failed to make the payment as agreed. In an action against the hotel company it was held that that company having received the benefit of the material furnished by the plaintiff on the faith of the guaranty that the price would be paid by B., and being in a position to protect itself by withholding from B. sufficient to pay the plaintiff's demand, it was estopped, when sued on the guaranty, to claim that it was ultra vires.—Kellogg-Mackay Co. v. Havre Hotel Co., C. C. A., 199 Fed. 727.

Heating Adjoining Houses—Covenant by Tenant.

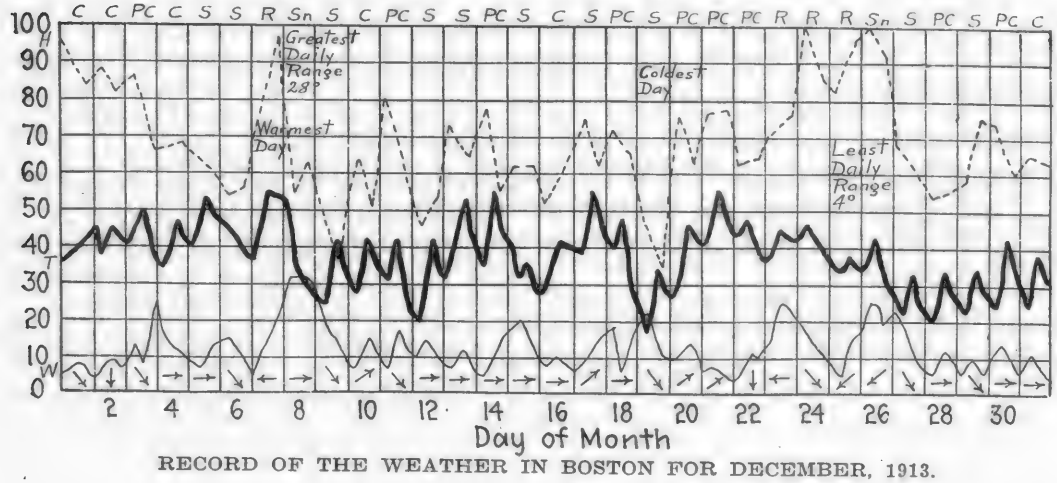
The owner of two adjoining houses, heated by a single boiler, the cost being shared equally by the tenants, leased the house with the boiler to a tenant who fully understood the situation and recognized an easement by implied reservation requiring him to do nothing to the disadvantage of the adjoining property. He thereafter disconnected the heating pipes leading to that property because his lease was silent as to heating it. In a suit by the owner it was held that, as he had no adequate remedy at law, equity would furnish a remedy by injunction to restrain the defendant from preventing the owner from maintaining a fire in the boiler. The tenant was required by his lease to surrender the premises at the end of his term in as good condition as reasonable use and wear would permit, damages by the elements excepted. It was held that he had no right to disconnect and plug up the heating pipes, rendering them useless for the purpose for which they were intended.—Smith vs. Taranto, 140 N. Y. Supp. 794.

The Weather for December, 1913.

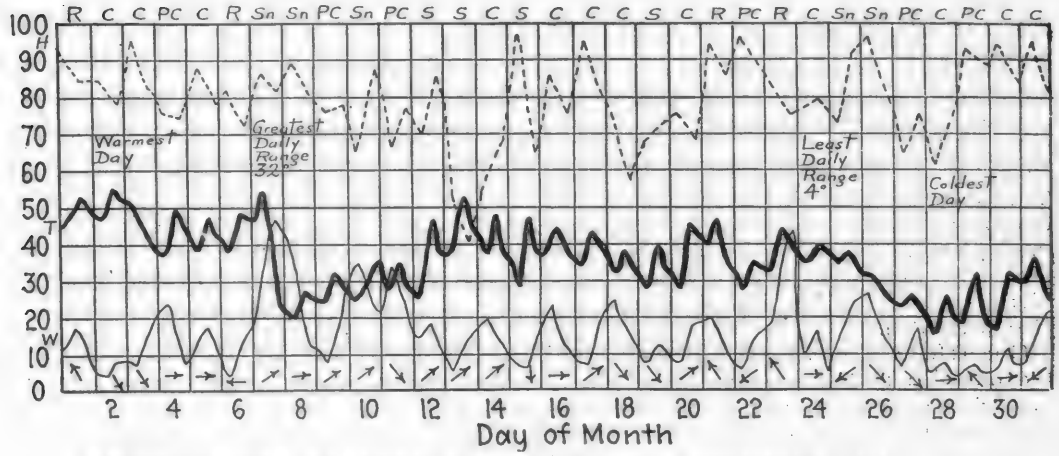
	New York.	Boston.	Pittsburg.	Chicago	St. Louis.
Highest temperature, degrees F.	58	56	54	57	63
Date of highest temperature	3	7	2	4	1
Lowest temperature, degrees F.	19	18	16	18	22
Date of lowest temperature	28	19	28	7	8
Greatest daily range, degrees F.	27	28	32	29	28
Date of greatest daily range	12	8	7	7	7
Least daily range, degrees F.	7	4	4	4	4
Date of least daily range	2	25	24	25	24
Mean temp. for month, degrees F.	39	38	36	37.4	41
Norm. temp. for month, degrees F.	34.4	31.6	34.7	29.3	35.5
Total rainfall, in.	2.4	3.05	2.6	0.45	1.62
Total snowfall. in.	0.3	0.9	11.3	2.7	11.2
Normal precipitation, this month, in.	3.45	3.41	2.73	2.07	2.23
Total wind movement, miles	13,910	8,233	8,216	8,665	6,705
Average hourly wind velocity	18.7	11.1	11	11.6	9
Prevailing direction of wind	N. W.	W.	W.	S. W.	N. W.
Number of clear days	11	10	4	9	8
Number of partly cloudy days	9	9	6	4	3
Number of cloudy days	11	12	21	18	20
Number of days on which rain fell	12	6	9	6	7
Number of days on which snow fell	1	2	5	2	3
Snow on ground at end of month, in.	...	...	3	...	0.8



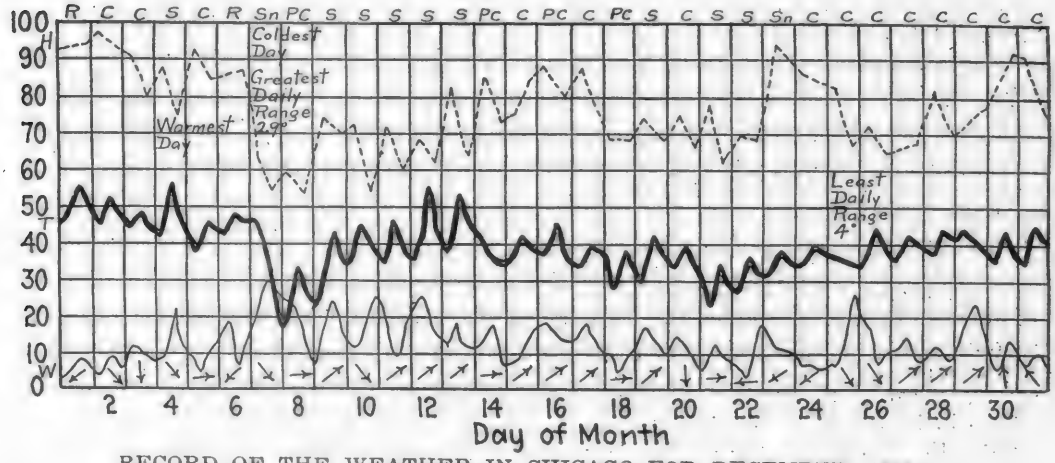
RECORD OF THE WEATHER IN NEW YORK FOR DECEMBER, 1913.
(Hourly Observations of the Relative Humidity are Plotted on this Chart.)



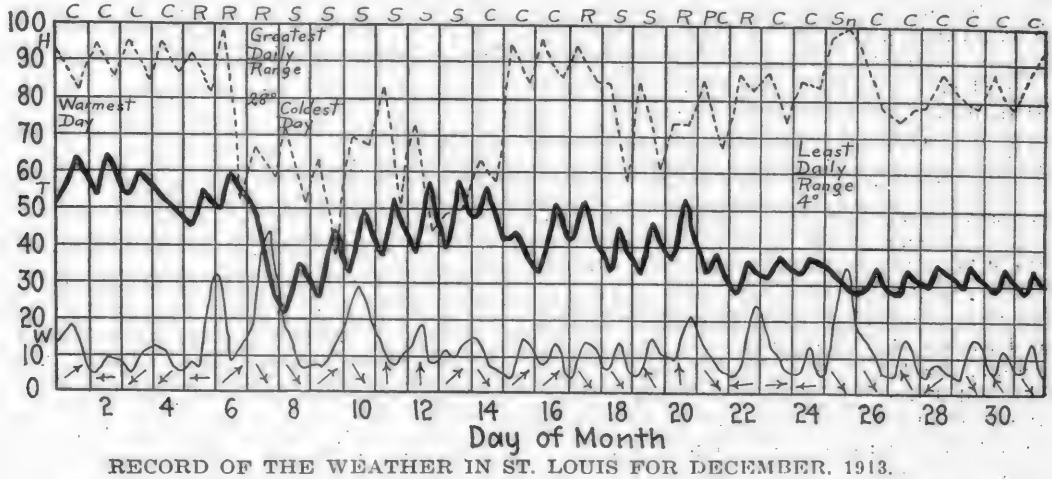
RECORD OF THE WEATHER IN BOSTON FOR DECEMBER, 1913.



RECORD OF THE WEATHER IN PITTSBURG FOR DECEMBER, 1913.



RECORD OF THE WEATHER IN CHICAGO FOR DECEMBER, 1913.



RECORD OF THE WEATHER IN ST. LOUIS FOR DECEMBER, 1913.

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau.
Heavy lines indicate temperature in degrees F.
Light lines indicate wind in miles per hour.
Broken lines indicate relative humidity in percentage from readings taken at 8 A. M. and 8 P. M.
S—clear, P C—partly cloudy, C—cloudy, R—rain, Sn—snow.
Arrows fly with prevailing direction of wind.

The Mt. McGregor Hot Water Heating Plant.

A DISCUSSION.

Interesting comments on the design of the hot water heating system for the sanatorium of the Metropolitan Life Insurance Co., at Mt. McGregor, N. Y. (published in THE HEATING AND VENTILATING MAGAZINE for December and January) are contained in expressions received from correspondents, the principal points of which are given herewith. The author's replies are also presented.

One reference was to the advantages of the one-pipe system for heating buildings located near each other, which were enumerated by the author as including smaller branch mains, less radiator surface, lower friction head and the fact that it may be given a greater reserve capacity for supplying future buildings; also that smaller branch mains are possible with a two-pipe system because there is a greater differential pressure between the flow and return trunk main of the two-pipe system than there is between the two points where the branch mains are taken from the one trunk main. The correspondent states that he has radiators connected on shunt lines, with supply and return on the same system, and uses the same size connections.

Exception was also taken by the correspondent to a statement that radiation will necessarily be larger with a one-pipe system, because the temperature of the water will be lower due to its low velocity through the radiator and to the fact that the same water must pass through one radiator before being reheated.

On these points the author states:

"In correctly designed systems the branches are smaller in a two-pipe system than in a shunt system, when operated under like conditions, i. e., with the same differential pressure at the pumps. This is because in a two-pipe system the average pressure producing circulation in the branch mains is somewhat greater than one-half the differential pressure at the pumps, while in a shunt system the average pressure producing circulation in the branch mains is less than the differential pressure at the pumps divided by the number of branches shunted from the main. In other words, the differential pressures on branch mains in a two-pipe system are in parallel, while they are in series in a shunt system. Then with the length of mains and the differential pressures at the pumps remaining the same in each case it is evident that the differential pressure on branch mains will not be affected by the number of branch mains added in a two-pipe system, but will decrease directly as the number added in a shunt system.

"Now, with the fact established that there is a greater differential pressure on the branch mains of a two-pipe system, it is obvious that the branch mains must be made larger in the shunt system in order to circulate as much water as the two-pipe system. The above conclusion is in strict accord with the best of engineering practice. See N. S. Thompson on 'The Equipment of Federal Buildings' (page 250), or Hoffman's Hand Book (page 201) (1910 edition).

"With a large number of branch mains and a small differential pressure, as in the case under consideration, it would not be practical in a shunt system to make the branch mains large enough to supply the same amount of water as is used in the two-pipe system. For this reason a smaller amount of water would be circulated through each building. The temperature of the return water would then necessarily be lower. With the average temperature of the circulating water reduced, it is evident that a greater amount of radiation would be required than is required with the higher water velocity and temperature in the two-pipe system. During the milder winter weather it is often desirable and economical in a hot water system to circulate the water by gravity, as has been done at the Mt. McGregor Sanatorium during the greater part of this winter. To make a shunt system operate by gravity and deliver the same amount of heat under the same conditions, the required radiation near the return end of the line would not only be greater but would be prohibitive, because of the low temperature of the return water."

Another point discussed by our correspondent is the statement that "Although most authorities recommend that the static head on the circulating pumps be kept as low as 100 ft., or 42 lbs., with a differential pressure of 25 to 30 lbs. the circulating pumps have a static head of approximately 160 ft. or 64 lbs. Because of this head the differential pressure caused by friction has been reduced to 17 lbs., making the pressure on the discharge side of the pump 81 lbs." This condition, says our correspondent, would require 34 lbs. of friction head, since the supply pressure is the static plus one-half the pumpage, while the return pressure is the static minus one-half the pumpage.

The author states that "it is approximately correct to say that the supply pressure is equal to the static pressure, plus

one-half pumpage, when the system is in operation; but this does not take into consideration the additional pressure at starting. To be more accurate, the supply pressure at normal operating conditions is greater than the static plus one-half pumpage, due to the added friction on this side of the boilers, hot water heater and their connections. The statement referred to may be misleading because of lack of explanation. The pump glands, casings, etc., at starting have a greater pressure on them than at any other time, so in determining the maximum pressure which they must withstand, this pressure was considered. This pressure is the combined pressure of the static head, approximately one-half the friction head, and the additional pressure required to bring the velocity of the water from zero to its normal velocity. As this rate of acceleration can not be definitely ascertained, in my calculations I estimated this required pressure as equal to the friction head on the supply side, thus making the pressure on the discharge side of the pump 81 pounds (64+17), as given."

Regarding the method of connecting the hot water and steam boilers, the point is made by our correspondent that if these boilers are made interchangeable with the piping on high pressure steam or hot water heating, it might be dangerous unless the steam boilers were cut off by a blank flange from the water system. In any case, a live steam heater would cost less than the inter-connecting piping and would give better satisfaction.

On this point the author states:

"Why the boiler plant as shown is dangerous, I am not able to see. Under normal pressures, gate valves have very little tendency to leak, and when there is the same pressure on each side of the valve there is no possibility of it leaking. Contrary to what has been said, I believe that the boiler plant as installed is much cheaper than a plant operated by a live steam heater, and is by far more simple to operate. In addition to the apparatus shown, a live steam heating plant would require a large live steam heater, additional boiler feed pumps, a large thermostatic valve and the additional steam piping for this apparatus. As for danger, there is greater danger of a thermostatic valve failing to work than there is of a gate valve failing to hold. In addition, the hot water boilers are more efficient because the comparatively low temperature of the water will reduce the temperature of the flue gases lower than it is possible for a high pressure boiler to do, thus getting a greater percentage of the heat from the hot gases."

Erratum.

Attention is called to an error that crept into the article, published in the January, 1914, issue, describing the heating equipment of the Mt. McGregor Sanatorium. On page 26, first column, eighth line from the bottom, the statement "values for the drop in pounds per 100 ft." should read "values for the drop in feet per 100 ft." This refers especially to the table (Table 2), giving the average values for pressure drop in flow and return mains.

The author also desires to call attention to an error in the formula given on page 26 of the January issue for loss in friction in feet per 100 feet of flow and return mains. The formula in its corrected form is as follows:

$$0.064 \frac{\sqrt{1.86}}{D^{1.25}}$$

where V is the velocity in feet per second and D, the diameter of the pipe in feet.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Illinois Chapter on Factory Heating.

"Hot Blast vs. Direct Steam Heating for Factory Purposes" was the subject for debate at the January meeting of the Illinois Chapter and led to an exhaustive discussion of the subject. The meeting was held at the Great Northern Hotel, January 12, with President H. M. Hart in the chair. Previous to the debate of the evening R. M. Stackhouse answered a question which had been deposited in the Question Box, regarding the effect of a long horizontal breeching on the draft of a house heating boiler. He showed how this condition would require a higher stack.

President Hart, on behalf of the Chicago Ventilation Commission, reported that tests had been made on two theatres in Chicago to determine the circulation of the air through them; also, that a test cabinet had been built for the purpose of testing the effects of ventilation and that two tests had been made. President Hart stated that he and Mr. Davis had passed 1½ hours in the sealed cabinet wherein the temperature had gone up and humidity risen to practically the point of saturation.

Mr. Hart asked the question as to "What is the difference in heat transmission between gases in a boiler and steam in a hot water coil?" Mr. Widdicombe and Mr. Hart will answer this question at the next meeting.

Mr. Stannard asked whether there is "any difference in the heat transmission through

one thickness of glass or through two thicknesses of glass with an air space between."

Mr. Widdicombe asked a question as to "what effect a drop in the smoke flue would have on a draft." This question, taken into connection with the report of Mr. Stackhouse, brought forth a great deal of discussion, and it was thought well to devote an evening, possibly at the May meeting, to the consideration of "Chimney Drafts."

Mr. Kirk took the position that there was very little difference and that he knew of one installation where a dip in the smoke flue had overcome the troubles experienced in the installation.

Mr. May stated that in Germany 90 per cent. of the installations have the smoke pipe underground, necessitating a dip. Mr. Hart asked Mr. May to serve in connection with the committee which he would appoint later to consider this topic.

The session was then turned over to the committee having charge of the evening's topic. In support of the hot blast method were S. R. Lewis, J. E. Miller and J. H. Kassa, and in support of direct steam heating were J. K. Lees, George H. Getschow and R. Widdecombe.

Some of the arguments advanced in behalf of hot blast heating were its adaptability for supplying air at varying temperatures, no heated surfaces close to the workers, absence of leakage, fewer valves, delivery of pure air, and the possibilities of its use in summer for cooling purposes by running cold water through the coils. The direct heating advocates urged the low cost of installation and maintenance, especially where the ventilation requirements did not enter into the question. The ease with which a direct steam heating system could be figured by contractors was also mentioned. Mr. Capron cited a case where ceiling coils were used at night and the fan operated during the day with satisfactory results. The arguments presented by Messrs. Lees, Lewis, Kassa and Miller are on file in the secretary's office.

NATIONAL DISTRICT HEATING ASSOCIATION

Programme for Sixth Annual Meeting

Announcement is made by Secretary D. L. Gaskill that the sixth annual convention of the National District Heating Association will be held in Rochester, N. Y., May 26-28, 1914. The programme as arranged by the executive committee is substantially as follows:

TUESDAY, MAY 26.

2:00 P. M. Welcome. Response. President's Address. Report of Secretary-Treasurer. Appointment of Nominating Committee. Report of the Underground Construction Committee.

8:00 P. M. Report of Nominating Committee. Address, Speaker to be selected. Address, "Manufacture of Welded Iron and Steel Pipe," accompanied by moving pictures.

WEDNESDAY, MAY 27.

9:30 A. M. Report of Meter Committee, A. D. Spencer, Detroit, Chairman. "Use of Bleeder Turbines in Connection with Steam Heating," R. D. DeWolf, of Rochester, N. Y. Election of Officers. Report of Record Committee, A. P. Biggs, Detroit, Chairman.

2:00 P. M. Discussion Session. The following subjects will be discussed:

"Hot Water Heating Under Forced Circulation," Thos. Donahue, of LaFayette, Ind.

"Expense of Operating Centrifugal Pumps vs. Double Acting Pumps," A. C. Rogers, of Toledo, O.

"Some Effects of Utility Regulation as Affecting District Heating," D. L. Gaskill and H. Almert.

"Effects of Superheated Steam on Heating Systems," Davis S. Boyden, of Boston, Mass.

"District Heating for Small Towns and Cities of 10,000 Population and Under," L. T. Mason, of Hornell, N. Y.

"Heat Losses from Buildings of Latest Construction," H. Byers Holbrook, of New York City.

"Which Is More Profitable, to Shut Steam Off at Night or Keep It On Continuously?" E. L. Wilder, of Rochester, N. Y.

"Economic Advantage to the Consumers of Central Station Heating Service Over Individual Heating Plants," N. M. Argabrite, of Elwood, Ind.

THURSDAY, MAY 28.

9:30 A. M. Report of Rate Committee. "Customers' Steam Heating Systems," H. R. Wetherell, Peoria, Ill.

2:00 P. M. "Commercial Steam Heating in New York City," by George W. Martin, general manager of the New York Service Co. Report of Educational Committee, D. S. Boyden, Boston, Chairman. Report of Station Operating Committee, Byron T. Gifford, Grand Rapids, Mich., Chairman.

There will be the usual exhibit in connection with the convention and elaborate entertainment will be provided, full details of which are now being arranged.

Current Heating and Ventilating Literature

Heating and Ventilating Large Buildings. Charles L. Hubbard. Illustrates and describes types of fans and considers the capacity and power required. 1,500 w. Prac. Engr., Chicago—Nov. 15, 1913. 20c.

HEAT CONDUCTION—

The Theory of the Penetration of Heat in Solid Materials. L. R. Ingersoll. Discusses problems in heat conduction, giving the theory in a form that will permit the easy solution of many examples. 3,000 w. Eng. News—Oct. 30, 1913. 20c.

HOT WATER SYSTEMS—

Vacua Hot-Water Heating Applied to Woolworth Building. Ira N. Evans. Compares the operating economies of such an installation with the present equipment of vacuum heating and non-condensing compound engines. 3,000 w. Power—Nov. 4, 1913. 20c.

SCHOOLS—

The School of the Future; Its Lighting, Heating and Ventilation. Septimus Warwick and Austen Hall. 3,000 w. Builder—Oct. 24, 1913. 40c.

NEW DEVICES

The Trapand Meter.

Among the specialties that are being handled by J C. Hornung, formerly of the W. H. Schott Co., who has recently established offices at 111 West Munroe Street, Chicago, is the Trapand meter, which is illustrated herewith. This device is built on the theory that no meter dependent upon the static head of condensation can be positive or accurate. The Trapand meter is controlled either by air or water pressure at 10 lbs. making it positive in its operation. The inlet valve is closed positively by the pressure before the outlet valve opens and vice versa, this feature insuring continuous operation and a high degree of accuracy. The Trapand meter as the word implies, is a trap and meter combined impelled by the same power It is intended to eliminate traps on equipment, two sets of connections and all chance of traps and meters blowing steam. The direct reading dial allows the meter to be read instantly and prevents mistakes in meter reading. It is stated that a space of 16 in. between the return line and the sewer connection is sufficient to install the meter with bypass, an important feature when there is lack of head room. The meter is made in four sizes with capacities in pounds of water per hour of from 800 to 4,000 and in square feet of radiation of from 2,400 to 12,000.

TRAPAND STEAM METER.

In addition to a line of steam specialties, which includes circulation and temperature control valves and expansion joints, Mr. Hornung is also prepared to make examinations of central heating and power plants, steam and hot water mains and house heating equipment.

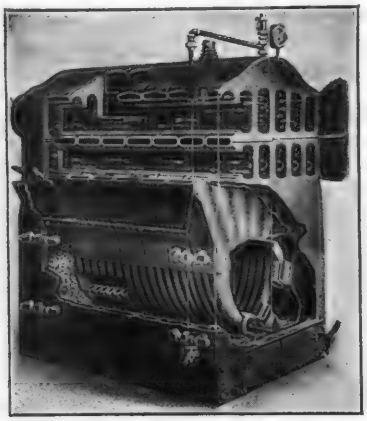
Installation of New Type of Down Draft Boiler.

The increasing popularity of the down draft type of boiler for house heating work lends interest to the design of the Surrell Boiler, which has been placed on the market by the Surrell Down Draft Boiler Co., 39 Cortlandt St., New York. This boiler, as will be noted, is composed of a central combustion chamber with water tubes on the inside of the firebox and an outside water jacket. The space between the combustion chamber and the outside water jacket is devoted to a coal magazine. The ashpit is used only for removing ashes, the combined feed and draft doors being attached to hoppers on the side through which coal is admitted, as well as the draft to the boiler. The down draft passes through the coal and fire to and between the tubes to the central combustion chamber where the gases are consumed, an arrangement designed to secure perfect combustion.

Care is taken that the tubes do not burn out, there being circulation of water through them and, in addition, they are vertical. This latter feature renders them self-cleaning.

The fire is of the depth of the tubes and as the coal settles and comes into contact with the fire, the gases are released gradually and pass down through the fire between the tubes to the combustion chamber.

A feature emphasized in the operation of these boilers is that all grades of coal can be used without change of grates. In a five-story apartment building, 40x75 feet, at 893 Stebbens avenue, Bronx, the maximum quantity of coal burned (pea coal) in any one month this winter was twelve



SURRELL DOWN-DRAFT BOILER.

tone, a steady steam pressure being maintained under those conditions from morning till night. In four other buildings in the same block, where the same size of Surrell boilers are in operation, the same economy was obtained.

In a test made of a similar installation operating on low pressure steam, an evaporation of 11 lbs. of water from and at 212° F. was obtained. An effort was made to keep the temperature of the gases leaving the boiler at a point not over 400° F. The average temperature of the flue gases at a point 8 ft. from the boiler was from 350° to 500° F. These results are those given in a report made by William J. Baldwin, Jr., who was retained to observe the test.

The height of the Surrell boilers over all is 72 in. and the width, 47 in. In the size mentioned, consisting of eight sections, the report states that "with an efficiency as high as this and burning 70 lbs. of coal per hour, the boiler can be rated at 2,600 sq. ft. of direct radiating surface, assuming each foot of surface will condense 3/10 lb. of steam per hour."

The manufacturers, who guarantee their ratings as listed, are now prepared to furnish the boilers in sizes running in capacities, from 500 to 5,200 sq. ft. of radiation.

They also call attention to a high pressure test on the Surrell boiler, made at one of the universities, in which an effiiciency was obtained of 90.41%. The evaporation was 14.13 lbs. of water to 1 lb. of combustible and the percentage of ash was 6.9%.

During the recent meeting of the heating and ventilating engineers, held in New York, January 20-22, the fact was mentioned in one of the papers read that boilers of the Surrell type are now being used in both Germany and Sweden.

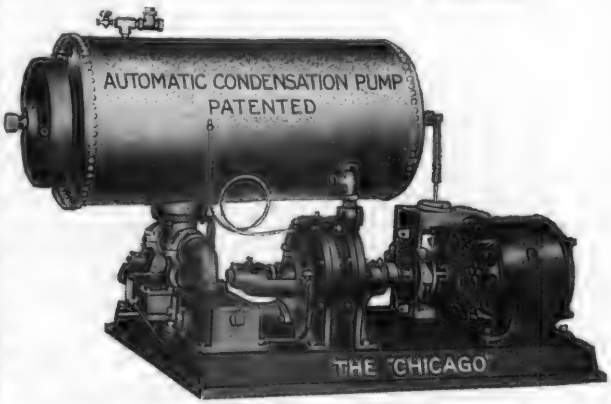
The boiler in its present form was patented July 15, 1913.

Condensation vs. Bilge Pumps.

Every engineer and architect is interested to learn of new ideas in arranging the mechanical equipment of a building, so as to avoid breakdowns, and inconveniences, and if these do occur, that they be least felt.

The following argument, which M. I. Weil, president of the Chicago Pump Company, presents, will doubtless appeal to a good many engineers, architects and builders.

In most buildings, the radiators and return pipes are at such a level that a comparatively deep basement or boiler pit is essential. This, in many cases, brings either basement or boiler pit below the sewer line, in which event it is necessary to install a bilge pump to keep the boiler pit dry. Should anything go wrong with the bilge pump, or should the fuse blow or the electric current fail for a time, the water would rise in the boiler pit, put out the fire and cause considerable inconvenience to all depending upon the heating plant, until such time when necessary repairs have been made to the pump, or until the current has been restored.



CHICAGO AUTOMATIC CONDENSATION PUMP.

All this, states Mr. Weil, may be avoided by installing a device of the type of the Chicago automatic electric condensation pump and receiver, as here illustrated. Such an outfit may be so con-

nected up, that it will take care of the condensation from the entire building or so that it will take care of only that condensation coming from radiators located below the water level of the boiler. The advantage of using a condensation pump and receiver over a bilge pump, according to Mr. Weil, lies in the fact that if the current should fail or fuse blow, or the condensation pump get out of order, only that portion of the heating system would be affected which actually depends upon the condensation pump and even the condensation from this portion of the heating system can be bypassed into the sewer, until current is restored or necessary repairs made and thus not affect the occupants of the building. In no case is there the danger of flooding the boiler pit as in cases where bilge pumps are used.

Then, we have the cost of operation and the longevity of the pumps to be considered. A bilge pump must be kept in service day and night, the entire year around, whether the heating system is in use or not. The current bills must be paid and the pump kept in running order; in short, it is a source of continual expense, whereas the condensation pump is in operation only that part of the day and year, when the heating system is in use. It has no operation expense and does not require looking after during the balance of the year. Also, because of the fewer months per year which it has to operate, it will naturally last a good many more years than the bilge pump.

Lastly, the bilge pump is a source of expense in first cost as well as in cost of operation and maintenance, whereas the condensation pump will save more than its cost in digging a boiler pit. In addition, it will save its cost in coal in a short time and continue to save something every year and will maintain a uniform temperature, as it will keep the radiators and return pipes clear of condensation water.

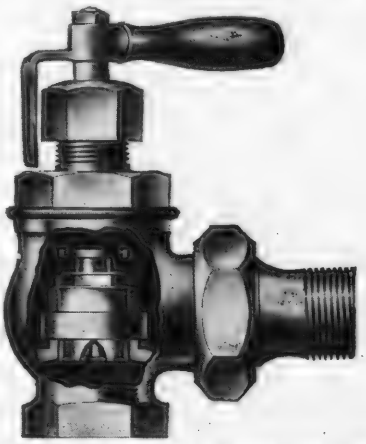
The Chicago Pump Company is a pioneer in the condensation pump business, having patented the tilting tank receiver which avoids the use of a float; and have further perfected its outfit by using an outer-bored ring-oiled bearing pump, as the manufacturers have found on account of hot water being a very poor lubricant that water-lubricated bearing pumps do not last long. The bearings of these pumps, it is stated, often overheat, stick and cause damage to motor. This is overcome by the oil lubrication.

The Chicago Pump Company manufactures a full line of bilge, house and fire pumps, as well as condensation pumps, but Mr. Weil states that where there is a choice between the bilge and condensation pump, the latter is the much more desirable. The company's catalogue D, which fully illustrates and describes the condensation pump, will be mailed to readers of this paper by addressing the Chicago Pump Company, 911 W. Lake St., Chicago, Ill.

New Features of Jenkins Bros. Fractional Radiator Valve.

The accompanying illustration shows the latest type of the Jenkins Bros. standard fractional radiator valve, embodying a number of new features. This type of valve is for use in connection with street steam systems, atmospheric systems, vacuum return line systems and vapor systems. In the new type the spindles are made of quick opening threads, and the valve opens wide in 10/12 of one turn. The top of the bonnet hexagon is divided into 11 spaces by marks or indentations, one being on each corner of the hexagon and one halfway between the corners.

The handle is provided with a pointer similar to the handle of the old valve, and when



NEW FEATURES OF JENKINS BROS. FRACTIONAL RADIATOR VALVE.

the valve is assembled complete this pointer stands 1/12 of a turn to the left of the center line of the valve as you face the union end. When the valve is wide open the pointer stands 1/12 of a turn to the left of the center line. These two marks have an additional marking; the one at the right being marked "O," and the one at the left "S." The space between the two marks is left blank and there is no graduation.

With this arrangement of marking there is a graduation for each 1/12 of the distance the spindle turns in opening or closing. The handle can be placed in twelve different positions on the spindle, and it is only necessary to remove the handle nut and change the

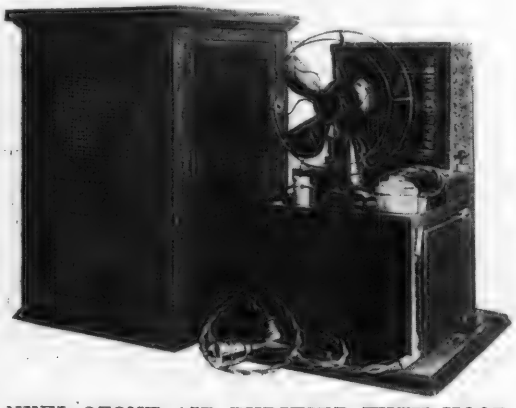
handle and replace the nut to accomplish this. This allows for a readjustment of the handle for every 1/12 of a turn, and which, by reason of wear of the disc or otherwise, may at any time be required.

The disc-nuts are made similar to the fractional nut, but holes or openings through the side of the nut are so designed that a fine regulation can be made of the amount of steam passing through the valve. When in use on the radiator, this feature, together with the graduations on the bonnet of the valve, allows of a close control of the amount of steam admitted to the radiator. The stuffing boxes can be repacked under pressure when the valve is wide open.

This valve is made by Jenkins Bros., 80 White Street, New York.

Trade Literature

PURE AIR, WHAT IT MEANS AND HOW TO GET IT, published by the Neel-Armstrong Corporation, Akron, O., is a new catalogue devoted to the Neel-Ozone air purification system. This apparatus consists of a transformer which, it is stated, equals the ozonizer itself in importance, for without a properly constructed transformer the ozonizer is useless. The purpose of the transformer is to change galvanic current into static current of high voltage. It first raises the voltage sufficiently high, 10,000 volts being the minimum, and it is also made to automatically care for the intense heat which resistances to the current evolves. The Neel-Ozonizer is designed to avoid entirely the generation of heat. The electrodes consist of copper wire hermetically sealed inside of glass tubes. These are of Bohemian glass and guaranteed to withstand 40,000 volts. It is stated that the ozonizer can be operated continuously for weeks without generating enough heat to make itself felt to the sense of touch. The cabinet of the Neel-Ozone air purifier is of quarter-sawed oak of ornamental design. The machines are furnished in two types, for business offices, assembly halls, etc. The apparatus is portable, the ozonized air being blown into the room by means of a fan furnished with the purifier. The company also undertakes to make series installations, using from one to fifteen small ozonizers, and also pipe conductor installations, consisting of a central ozone generating plant and piping with distributing areas at convenient points. Size 5¼x7¾ in. Pp. 16.



NEEL-OZONE AIR PURIFIER WITH HOOD REMOVED (MODEL G).

SHANK COMBINED ALTITUDE GAUGE AND THERMOMETER, designed to meet the requirements heretofore used in connection with hot water heating boilers, is the subject of new circular matter, issued by the manufacturer, the American Specialty Mfg. Co., Des Moines, Ia., and sold through Jas. P. Marsh & Co., Chicago, Ill. The Shank gauge is complete in itself and can be installed complete in three minutes' time in the ½-in. opening usually provided in the boiler for thermometer. The thermometer tube of the gauge sets flush in the dial and is fully protected. The Shank gauge, it is stated, can be used successfully where heat generators are installed, as the altitude of the water is shown in the morning before any pressure has been exerted in the system and the abnormal pressure is also recorded, thus answering a two-fold purpose. It is also emphasized that where this gauge is used on such installations, the expense of connecting the gauge to the pipe is eliminated. This instrument is listed at $4.00.

SHANK COMBINED ALTITUDE GAUGE AND THERMOMETER.

POWELL VALVES, featuring the "White Star," manufactured by the Wm. Powell Co., Cincinnati, O., are discussed in a new booklet which, it is stated, is issued to introduce the trade to a radical improvement in valve construction. The name of "White Star" is given to the valve because of the peculiar alloy used in the disc and seat which is silver white in color. The discs are cast of the "Powellian" white bronze, which melts only at a high temperature (2000° F.), making them practically indestructible. They differ from the ordinary disc of one-wearing surface in that they have duplicate-wearing faces, and are secured to the disc holder and protected on the upper or unused face, until the lower face is worn out. They may then be reversed for further service. They are stated to be especially adapted to high pressure or superheated steam. Full constructive details are contained in the circular. The booklet also takes up the Powell "White Star" check valves, iron body "White Star" globe angle and check valves, and yoke top gate valves. Size 3¼x6 in. (standard). Pp. 16.

VENTILATING FOR DWELLINGS, RURAL SCHOOLS AND STABLES, by F. H. King, formerly professor of agricultural physics of the University of Wisconsin, containing, among other things, an exposition of the King system of barn ventilation, is a unique work, as it deals largely with conditions where there are no mechanical appliances or warm-air furnaces in use. The first part of the book is devoted to a graphic discussion covering Nature's provision for ventilation of body tissues, amount of air required for a daily ration, quality of breathed air, effects of insufficient ventilation and the amounts of air which should move continuously through dwellings and stables. A second portion of the book is devoted to the principles of natural ventilation, this portion including numerous photographs and diagrams showing methods of building construction to secure the desired results.

Under the third portion, devoted to practice of ventilation, the author gives the best room and stable temperatures, light for dwellings and stables, ventilation of dwellings (including those already built), heating and ventilation of rural school houses and churches, and stable ventilation, including arrangement of dairy stables, stables for swine and sheep and poultry houses.

The book contains much matter that is quite in accord with recent pronouncements of hygienists and other investigators and the elements of the subject are presented in an unusually readable manner. The book contains 63 illustrations. Size, 7¾x5½ in. Pp. 126. Published by Mrs. F. H. King, 1540 University Avenue, Madison, Wis. Price, 75 cents.

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MONASH NOISELESS SYSTEM OF VACUUM HEATING

SILENCE EFFICIENCY ECONOMY

Used with entire success in HOSPITALS, HOTELS, CLUBS, THEATRES, FACTORIES, SCHOOLS, COLLEGES, OFFICE BUILDINGS and PUBLIC INSTITUTIONS where **ELIMINATION OF NOISE** from the heating plant is desired.

NEW MICHIGAN CENTRAL DEPOT, DETROIT, MICH.
Equipped with **MONASH NOISELESS SYSTEM** of Vacuum Heating

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TRADE AND MISCELLANEOUS NOTES

Coming Events.

Third Monday in Each Month.—Meeting of the New York Chapter, American Society of Heating and Ventilating Engineers, at the Engineering Societies Building, 29 West 39th Street, New York (evening).

Second Monday in Each Month.—Meeting of the Illinois Chapter, American Society of Heating and Ventilating Engineers, in Chicago (evening).

Second Tuesday in Each Month.—Meeting of the Massachusetts Chapter, American Society of Heating and Ventilating Engineers, in Boston (evening).

Deaths.

Herman C. Meinholz, vice-president of the Heine Safety Boiler Co., St. Louis, Mo., and superintendent of the company's works since 1895, died December 24, 1913, at his home in that city. He entered the employ of the company at the age of 19 and literally grew up with the business. Mr. Meinholz was 45 years old. He is survived by a widow and five children.

Miscellaneous Notes.

Tacoma, Wash.—One of the largest ventilating systems in the world will be installed in the Stampede Tunnel on the line of the Northern Pacific Railroad, according to T. Z. Krumm, engineer in charge of the construction between Easton and Lester. The system will be expected to clear the tunnel of all smoke within 10 minutes after the passage of a train. The outfit, it is estimated, will cost $150,000. The con-

Genuine Armstrong Stocks and Dies

MALLEABLE HINGED PIPE VISES
PIPE CUTTERS
PIPE MACHINES, HAND OR POWER

The Tools of Constant Service

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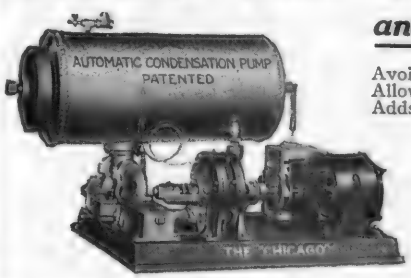
THE ARMSTRONG MFG. CO., 321 Knowlton St., BRIDGEPORT, CONN.

Look at This Model Condensation Pump *and* Tilting Receiving Tank



Avoids digging boiler pit and saves 20-50% coal.
Allows tempering coils or radiators to be placed below water level in boiler.
Adds to the efficiency of steam heating plant.

Embodies All The Best Features and Latest Improvements in This Line.

Write For Catalog D.

CHICAGO PUMP CO., 911 West Lake St. CHICAGO

Mfrs. of Turbine House and Bilge Pumps. Sewage Ejectors and Electric Cellar Drainer.

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

struction is expected to be finished by next May.

Olympia, Wash.—The Washington Public Service Co., which owns the Olympia waterworks and which is now installing a steam heating system in the business district of Olympia, has filed a $5,000,000 first mortgage bond issue with the county auditor. An issue of $125,000 will be made at once for the purpose of finishing the installation of the heating plant.

Cincinnati, O.—Members of the Twentieth Century Club recently visited the principal nickel show houses in the city, armed with thermometers to test the air. Reports of the atmospheric conditions of the houses will be made to Health Officer Landis.

Chicago, Ill.—William K. Fellows, of Fellows, Perkins & Hamilton, architects, has left for China where he will supervise the construction of a group of new buildings for the Shantung Christian University at Tsinan, Shantung, and another group of buildings for the University of Nanking at Nanking. The central buildings for each of these universities were donated by Mrs. Cyrus H. McCormick, Sr. The Shantung University group will contain 19 buildings, nine of which will be started at once. Six new buildings wll be started for the University of Nanking. The total cost of the buildings will be $750,000. Heating and plumbing material will be shipped from the United States.

Barnesboro Spangler Light, Heat & Power Co., Harrisburg, Pa., is the new name of the Spangler Light, Heat & Power Co. The capital stock of the company is $100,000 and the directors are John Barnes, E. L. Clarke and Harry E. Bird, of Philadelphia.

Portland, Ore.—The Northwestern Electric Co. has finished the underground gridironing of the business district of Portland for its steam heating plant. A total of 42 blocks of this type of work is embraced in the first unit of installation which will supply all the downtown section. Heat will be turned in the system in the course of the next few weeks. The work of laying the underground steam mains, which has been going on for several months in the streets of Portland, embraces many interesting features. Use has been made, for instance, of a large pavement cutter, said to be the only one of its kind in the country, which is the invention of F. J. Walsh, the engineer in charge of the work. This machine consists of a combination of a gas engine and a compressor, with two air drills. With three men to operate it, the machine does the work of 30 men and, it is said, reduces the cost of cutting the pavement about 50%.

New Orleans, La.—Dr. Dowling of the State Board of Health, has sent out notices to all managers of theatres, owners of hotels and restaurants, ordering them to give more attention to the subject of the ventilation of such buildings. A vigorous campaign is being planned against offenders in this respect.

Chicago, Ill.—The ventilation of the street cars of Chicago is still engaging the attention of the health authorities. According to Health Commissioner Young, in the cars equiped with ventilating fans, not over 20% of the fans are operated. An opinion received from the corporation counsel is to the effect that the city is vested with full powers to regulate the ventilation of street cars.

DeKalb, Ill.—A petition has been presented to the city council for a franchise to build a steam heating plant to furnish heat to the residence districts of the city and for a garbage incinerator to take care of the city's refuse.

B. E. Van Auken, president of the Consolidated Engineering Co., Chicago, was married January 3 to Miss Helen Caspar of Chicago.

Louisville, Ky.—According to the recent decision of the Kentucky Court of Appeals, the $1,000,000 bond issue put out by the city of Louisville for the construction of new school buildings, is legal and valid. This will mean considerable work for the building trades in Louisville during the ensuing year.

Columbus, O.—The new schedule of insurance rates under the workmen's compensation law in Ohio include the following: Carpenters, generally, $2.30 on $100 of the payroll; interior carpenters, $1.10; residence carpenters, $2.00; brick masons, $2.70; stone masons, $2.70; concrete construction workers, reinforced, $4.00; ordinary concrete construction workers, $3.00; concrete pavement workers, $1.20; outside painters, $2.00; inside painters, $1.40; plumbers, $1.40; electricians, $1.40; roofers, $3.00. A special committee of the Columbus Builders' and Traders' Exchange has been appointed to investigate the complaints of the Columbus contractors that the rates charged are excessive and, in many cases, higher than those charged by liability insurance companies.

Johnstown, Pa.—The Fort Stanwix Hotel Company has had plans drawn for a new hotel at Johnstown, to cost $400,000. The building contract has already been awarded

to the Thompson-Starrett Co., of Pittsburgh.

American Institute of Architects, at its recent convention in New Orleans, went on record in favor of the separate letting of heating, plumbing and electrical contracts. The full text of the resolution as adopted, is as follows:

Resolved, That the American Institute of Architects in convention assembled recommends to the members of our profession the adoption of the practice of direct letting of contracts for mechanical equipment, such as heating apparatus, plumbing and electrical equipment. This recommendation is based on the conviction that direct letting of contracts as compared with sub-letting through general contractors affords the architect more certain selection of competent contractors and more efficient control of execution of work and thereby insures a higher standard of work, and, at the same time, serves more equitably the financial interests of both owner and contractor.

American Society of Mechanical Engineers has enlarged the size of its Journal, greatly increasing the scope of its contents. Hereafter the Journal will include the Transactions and the republication of the Transactions in a separte volume will be discontinued. The January issue contains, among other things, a detailed report of the committee on standardization of flanges, together with the discussion of same at the society's recent annual meeting.

Committee of Manufacturers on Standardization of Fittings and Valves, at a meeting held in New York, December 17, 1913, adopted the following resolution:

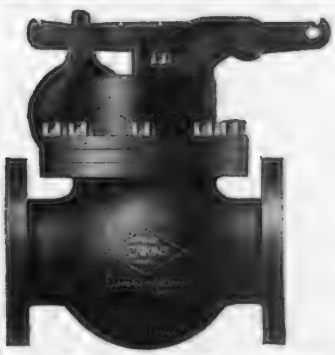
Resolved, That the schedule which was adopted by this committee on September 17, 1913, and which was reported by the Committee of The American Society of Mechanical Engineers on Standardization of Flanges, at their annual meeting, held December 3, 1913 (which subject is held over for their next regular meeting), be concurred in and reaffirmed, to take effect as originally planned, on January 1, 1914.

Merchants' Association of New York has published a pamphlet analyzing the new workmen's compensation law of New York State, for the information of employers and employees. The analysis was prepared by William H. Hotchkiss, former superintendent of insurance of New York. The pamphlet is being sent out by the Merchants' Association to all its members. The association's headquarters are at 233 Broadway, New York (Woolworth Building).

Central Supply Association will hold its next regular meeting in Chicago, February 25, 1914, at the Hotel Sherman. The address at the afternoon session will be delivered by Marshall Cushing.

Manufacturers' Notes.

J. K. Siphon Ventilator Co., Little Rock, Ark, which was recently organized with a capital stock of $100,000, has completed its



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The Jenkins Bros. line includes radiator valves of all kinds, and globe, angle, check, back pressure, automatic equalizing stop and check, blow-off—in short, about every type required in the modern power plant. Write for our handy catalogue.

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THE LATEST AND BEST BY EVERY TEST Send for Bulletin No. 73

New York 50 Church St. **The Industrial Instrument Co., Foxboro, Mass.** Chicago Monadnock Bldg.

plant at East Fifteenth Street and the Rock Island Railroad crossing, for the manufacture of its patent ventilator which is the invention of J. K. Robinson, president of the company. Various types of the ventilators will be made for buildings, cars, hotels, etc. An output of $2,000,000 in these devices is provided for in the new plant. This ventilator, it is claimed, will remedy the defect in any stubborn smoke-stack or chimney flue and in the case of the latter, a register may be placed in any room adjoining the chimney flue, through which dead air may be expelled.

American Radiator Co., Chicago, Ill., announces the election as vice-presidents of Louis Bruch, manager of the company's advertising, and Archer A. Landon, manager of the company's Buffalo plant. The appointments are effective February 1. Mr. Bruch has been identified with the heating industry since 1889, when he became connected with the Pierce Steam Heating Co. He will remain as advertising manager of the company.

National Radiator Co., Johnstown, Pa., distributed a bonus of $1,962.75 to 53 of its employees as a result of the company's business for the year ending December 20. The highest sum received by any one man was $60.48 and the lowest, $16.65.

Beaton & Cadwell Co., New Britain, Conn., manufacturers of floor sleeves and heating specialties, is planning a 4-story addition to its factory, also a power house. The addition will be devoted to the manufacture of the Eagle line of valves, which the company recently purchased from the Eagle Mfg. Co.

American Blower Co., Detroit, Mich., reports an order of eight air washers, each with a capacity of 56,000 cu. ft. per minute for the plant of the Ford Motor Co.; also an order for air washers with a capacity of 160,000 cu. ft. per minute, for the Kaufman Department Store, Pittsburgh, Pa.

New York Central Iron Works Co., Hagerstown, Md., recently incorporated with a capital stock of $225,000, to take over the business of the New York Central Iron Works, Geneva, N. Y., manufacturer of the Dunning boiler, has elected the following officers: President, M. P. Moller, owner of the Moller Organ Works and president of the Crawford Automobile Co.; vice-president, L. D. Perry; secretary, C. D. Wagaman; treasurer, C. E. Whipple; executive committee: C. E. Whipple, M. P.

Quickly Pays for Itself in Fuel, Labor, Time and Money Saved.

J-M Sectional Conduit dispenses with separate heating plants in buildings scattered over a wide area, and, through a system of scientifically protected underground piping, enables one central plant to supply all the heat and power required. Thus with

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after ten years' service

the fuel consumption is greatly reduced; the labor cost is brought down to a minimum; less time is demanded for attention to the plant; the large outlay for the establishment, operation and maintenance of separate plants is saved; there is no accumulation of ashes, dirt and coal in each building; and there is no annoyance. J-M Sectional Conduit is equally efficient for conveying underground gas, chemicals, vapors, water, liquids, etc. Practically indestructible. Can be taken up and relaid without injury. Costs nothing for maintenance.

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Manufacturers of Asbestos Packings, Pipe Coverings, High Temperature Cements, Boiler Preservative, Conduit, Metallic Hose, Fuses, Boiler Plugs, Stack Lining, Tube Cleaners, etc.

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Moller, C. D. Wagaman and L. D. Perry. The company will begin operations with a payroll of 49 men.

American District Steam Co., No. Tonawanda, N. Y., is favoring the trade with a calendar of unusual size and beauty, depicting "The First Inauguration of Washington," from a painting by De Land. An explanatory description of the scene accompanies the calendar which measures 22x45 in.

Wm. H. Page Boiler Co., New York, calls attention to its line of Volunteer and Monarch boilers through an attractive calendar containing large half-tone reproductions of each type of boiler.

Bishop-Babcock-Becker Co., Cleveland, O., has appointed Lloyd W. Young as the company's advertising manager, succeeding Richard C. Crisp. Mr. Young was previously advertising manager for the Billings-Chapin Co.

H. Mueller Mfg. Co., Decatur, Ill., has appointed Harry Eggleston, formerly with the United States Radiator Corporation, as its representative in Nebraska. Other changes are the appointment of L. M. Ross who will cover Iowa, and E. F. Kennedy, who will take care of the company's interests in Minnesota. C. H. Dubois has been transferred from Illinois to Texas and R. L. Moore will be the Illinois representative.

Monash-Younker Co., Chicago, Ill., reports an order for the equipment of the factory of the Calumet Baking Powder Co., at 41st Street and 41st Avenue. and Fillmore Street, Chicago, with the Monash noiseless system of vacuum heating and drying apparatus. Richard E. Schmidt and Garden & Martin are the architects, and the Mehring & Hanson Co., Chicago, the heating contractors.

Buffalo Forge Co., Buffalo, N. Y., reports that its recent orders include the apparatus for the heating and ventilating system of the Stevens Building, at Portland, Ore., Whidden & Lewis, architects. The main supply units are Buffalo Conoidal multi-blade fans, engine driven, with tempering coils and Carrier air washers. There is also an exhaust fan of the high-speed Conoidal type, driven by Buffalo Spiro steam turbine. The company's Portland representatives have also obtained the contract for two 190-in. Conoidal fans, with engines, for ventilating the hydro-electric power house of the Northwestern Electric Co., which is to be the largest water power plant in the northwest.

C. & C. Electric & Mfg. Co., New York, has discontinued its Pittsburgh office, in charge of Ludwig Hom-

Sirocco Multi-blade Fan Exhausting Kitchen Odors

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TRADE MARK.

Multi-Blade Ventilating Fans

Can be used to great advantage in connection with cooling and exhausting odors from kitchen, smoke from club rooms, ventilating toilet and bath rooms.

They deliver twice the amount of air as the ordinary steel plate fan, hence require only **one-half** the space for the same duty.

Sirocco Multi-Blade Fans operate quietly and require **less power** to deliver the same amount of air when compared to the ordinary steel plate fan twice the diameter. They are easy to install and are nicely adapted to sheet metal work.

Our Discounts to Dealers, Contractors, and Sheet Metal Workers are attractive. Ask us about them.

AMERICAN BLOWER COMPANY

DETROIT. MICHIGAN. U.S.A.

Canada Sirocco Company, Limited
Windsor, Ont., Manufacturers for Canada

mel & Co., and this territory will now be taken care of by the company's Philadelphia manager, J. C. Chamberlin. As agent for the southern part of Ohio, the company has appointed P. A. Saylor, with offices in the Greenwood Building, Sixth and Vine Streets, Cincinnati.

Johnson Service Co., San Francisco (Cal.) Branch, announces a new combined office and stock room location at 149 Fifth St., San Francisco. A. G. Caldwell is manager.

Crane Co Chicago, has started to build the first two units of its new plant, each of which will be 80x500 ft. The cost is estimated at $450,000.

Hudson Boiler Mfg. Co., New York, elected the following officers and directors at its annual meeting, January 5: President and treasurer, Howard T. Gates; secretary, Benjamin F. Lane; assistant treasurer, Israel Jacobs. Directors: Howard T. Gates, Edward E. Fox, Benjamin F. Lane, F. A. Leland and J. J. Bennett.

W. A. Case & Son Mfg. Co., Buffalo, N. Y., announces the consolidation of the following concerns under the name of the W. A. Case & Sons Mfg. Co.: Plumbers and Steamfitters Supply Co., Buffalo, N. Y.; Buffalo Radiator Co., Buffalo, N. Y.; Nashville Plumbers & Mill Supply Co., Nashville, Tenn.; Eastern Range Boiler & Welding Co., Conshohocken, Pa., and the W. A. Case & Sons Mfg. Co., Buffalo, N. Y. The new concern is capitalized at $2,500,000, of which $1,750,000 is common and $750,000 is preferred stock. The directors are Whitney G. Case, Joseph P. Fells, Edward W. Case, Chester W. Fells, Fred A. Mason and Harry Montgomery, all of Buffalo, and Herbert B. Hallett, of Norristown, Pa. Mr. Hallett will be in charge of sales of the company's line of house heating boilers and radiation and range boilers. W. N. Billings will be in charge of the company's Nashville branch.

Buffalo Forge Co., Buffalo, N. Y., has opened offices at 176 Federal Street, Boston, Mass., for its fan ventilating and pump departments. The company is represented in the New England territory by B. R. Andrews, formerly with the B. F. Sturtevant Company.

Armstrong Cork & Insulation Co., Pittsburgh, Pa., is the name under which the insulation department of the Armstrong Cork Company will hereafter be conducted. The personnel of the management and sales force will be the same as heretofore. The growing importance of the company's insulation business and the recent addition to its line of steam pipe and boiler coverings (which contain no cork) rendered it desirable to make this change for the more satisfactory and efficient transaction of the company's business.

New Firms.

J. C. Hornung, Chicago, Ill., for the past fourteen years associated with the W. H. Schott Company, Chicago, in the design and construction of central heating and power plants, has opened an office at 111 West Monroe Street, Chicago, to continue this line of work, and also to place on the market a line of specialties which he has developed, including steam traps, condensation meters, circulating and temperature control valves, and expansion joints.

Business Chances.

Washington, D. C.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, for the following-named work:

Until Feb. 16, 1914, for the mechanical equipment, except roof drainage and elevators, of the U. S. Post Office at Denver, Col. Architects, Tracy, Swartwout & Litchfield, 244 Fifth Avenue, New York.

Until Feb. 18, 1914, for the construction, including mechanical equipment, of the U. S. Post Office at Berkeley, Cal. Two stories and basement, 11,800 sq. ft. ground area.

Until Feb. 28, 1914, for the construction complete, including mechanical equipment, etc., of the U. S. Post Office at Piqua, O. Two stories, 10,000 sq. ft. ground area.

Until Feb. 28, 1914, for the construction, including mechanical equipment, etc., of the U. S. Post Office at Searcy, Ark. One story, mezzanine and basement, 3,800 sq. ft. ground area.

Until Feb. 28, 1914, for the construction complete, including mechanical equipment, of the U. S. Post Office at Big Rapids, Mich. Two stories and basement, 3,940 sq. ft. ground area.

Until March 9, 1914, for the construction complete, including mechanical equipment, etc., of the U. S. Post Office at Williston, N. D. Two stories and basement, 4,500 sq. ft. ground area.

Business Troubles.

Pierce, Butler & Pierce Mfg. Co., Syracuse, N. Y., whose affairs, as announced in last month's issue, were placed in the hands of a Federal receiver January 10, will have its business continued by Arthur W. Loasby, president of the Trust & Deposit Co., of Onondaga, N. Y., who was appointed receiver by Judge Ray, of the U. S. Court, at Norwich, N. Y. As stated, the liabilities are placed at $1,902,352 and the assets at $3,291,242. W. K. Pierce, until

14,755,000 Cubic Feet of Air per minute is the conservative rating of Sturtevant (REG. U. S. PAT. OFF.) Fans ordered in December

This large volume of fan orders received from all quarters of the world, and including orders from some of the largest industrial corporations in the country, is conclusive proof of the high standing of the Sturtevant Fan in the industrial world.

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B. F. STURTEVANT COMPANY

HYDE PARK, BOSTON, MASS., and all principal cities of the world

recently president and general manager of the company, and who resigned some time ago, was a grandson of the founder of the company.

Kellogg-Mackay Co., Chicago, Ill., jobbers and manufacturers of heating and plumbing supplies and who handled the product in the west of the Pierce, Butler & Pierce Mfg. Co., were declared insolvent January 9, one day previous to the announcement of the receivership for the Pierce, Butler & Pierce Mfg. Co., of Syracuse, N. Y. The Central Trust Company and F. W. Fix were apointed receivers. The liabilities of the company are placed at $1,500,000; assets not given. The petitioning creditors are the Pierce, Butler & Pierce Co., with a claim of $800,000; Northern Bank Note Co., Chicago, with a claim of $45.00; and the Bishop-Babcock-Beecker Co., of Cleveland, with a claim of $267.81. The officers of the company are: President, P. M. Beecher, elected to that office three months ago; first vice-president, C. V. Kellogg; second vice-president, W. F. Woodruff; secretary and treasurer, F. W. Fix; assistant treasurer, H. B. Butler.

Utica Pipe Foundry Co., Utica, N. Y., has filed a petition in bankruptcy, with assets scheduled at $958,687 and liabilities at $410,235. It is stated that half of the assets comprises machinery that is valued on the basis of a going concern. The company was organized in 1889 and Charles Millar was its first president. Its present president is Alfred H. Dobson. Announcement is made that the only connection between the pipe foundry and the Charles Millar & Son Co., Utica, was that the latter was selling agent for the Utica Pipe Foundry Co.

New Incorporations.

Carl Johnston Co., Chicago, Ill., capital $15,000, to engage in heating, plumbing, etc. Incorporators: Delbert Z. Clithero, E. C. Rockwell and James H. Dunn.

P. J. Bohan Co., Chicago, Ill., capital $2,500. Incorporators: M. B. Morris, Charles Schusterman and Vesta Berry.

J. K. Siphon Ventilator Co., Little Rock, Ark., capital $100,000, to manufacture ventilators, etc.

F. W. Webb Co., Gary, Ind., capital $3,000, to conduct a heating and plumbing business. Incorporators: Frank W. Webb, George H. Stellman and Eugene A. Monast.

Weaver Heating, Power & Process Co., Houston, Texas, capital $100,000. Incorporators: H. E. Weaver, H. R. Bartlett, George Mammon, G. W. Hindman and Henry Rodridge, all of Houston; and E. L. Porick and W. F. Brice, of San Antonio.

F. H. Sherman Co., Williamstown, Mass., capital $15,000, to conduct a heating and plumbing business. Incorporators: Fred H. Sherman, Earle D. Sherman and Elmer C. Walden.

Carl John Stein Co., Chicago, Ill., capital $15,000, to take over the heating and plumbing business of Carl John Stein at 853 South State Street. Incorporators:

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Spencer Turbine Vacuum Cleaners

are manufactured in sizes from ¾ H. P. to 40 H. P.

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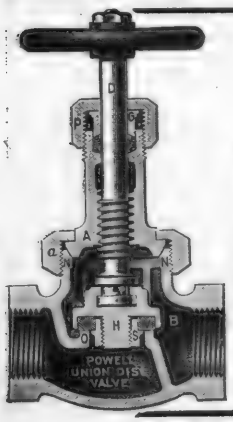

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Observe the bevel ground joint connecting body and bonnet—Red lead or cement is unnecessary to make it tight.

Notice the swivel union nut and threads on outside of valve body, where steam cannot reach them.

Valve body outlasts many discs. Best material and workmanship insure long life.

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DEPENDABLE ENGINEERING SPECIALTIES

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THE STRAINER

The strainer is only one detail in the design and construction of an air washer—but a very important one

NOTICE carefully the strainer illustrated above. Notice the large area of double straining surface. This large area requires less frequent cleaning—it reduces the resistance that must be overcome by the pump, thereby saving H.P. and increasing efficiency.

This strainer is easily removed for cleaning, there are no bolts or clamps to be unfastened. It is light in weight which means easy handling. The large opening permits easy access of brush or hose for cleaning.

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is designed to produce the highest efficiency and durability. Fifty years experience in designing and building heating and ventilating systems has proven to us the weaknesses of other apparatus. In designing our air washer, we have endeavored to overcome these weaknesses. How well we have succeeded is shown in the large sale of these washers in the short time they have been on the market. They have been accepted by leading engineers and architects for some of the finest buildings in the country.

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D. A. Clithero, E. C. Rockwell and James H. Dunn.

Scott Co., San Francisco, Cal., capital $100,000, to conduct a heating and plumbing business. Among the incorporators are W. P. Scott, until recently vice-president and general manager for the John G. Sutton Co.; H. M. Van Pelt, who will be in charge of the heating department, and C. J. Dougherty, who will be manager of the plumbing department.

Hawkeye Supply Co., Mason City, Ia., capital $75,000, to engage in the heating and plumbing supply business. Among the principals are C. B. Sherman and G. B. Pray, of Fort Dodge. Among the stockholders are Pray, Sherman and C. H. McNider, president of the First National Bank of Mason City.

Contracts Awarded.

Adam Garber, New Brunswick, N. J., heating and plumbing Charles A. Conrad's new theatre at Chrome for $4,022.

Pomerene Co., Lincoln, Neb., steam heating and ventilating new Lincoln High School building; the plumbing contract went to the F. C. Phillips Co., of Lincoln.

Savage Heating and Plumbing Co., Reno, Nev., heating and plumbing court house at Las Vegas, Nev., for $4,426.

Rautman Plumbing & Heating Co., Seattle, Wash., heating and plumbing assembling plant for the Ford Motor Car Co., at 1151-1169 East Valley Street.

Wheeler & Blaney, Kalamazoo, Mich., heating, ventilating and plumbing new city hall at Ann Arbor, Mich., for $27,749.70. Other bids were: L. J. Hanchett, $7,950 (plumbing only), and Bert B. Stevens, $19,-905 (heating only).

Jones Bros., Central Valley, N. Y., steam heating Idle Hour Inn at Monroe, which will be used as a school building for the McKensie Preparatory School. The work amounts to $3,500.

West Virginia Heating & Plumbing Co., Charleston, W. Va., heating eleven-story office building for the Frankenberger estate in Charleston; also heating twelve-story bank and office building for the Kanawha National Bank, also in Charleston.

Reeve & Pettit, Salt Lake City, Utah, heating and plumbing addition to hospital building for Latter Day Saints, for $60,000.

F. W. Spencer, Salt Lake City, Utah, steam heating and plumbing Newhouse Hotel building in Salt Lake City, for $90,000. The equipment will include 105 shower baths.

Davidson & Harris, Salt Lake City, Utah, steam heating and plumbing new East Side High School building, at Salt Lake City, for

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A set of six tables printed on heavy bristol board. Size 7 x 9 inches. Wire hanger attached. Handy for shop or drafting room.

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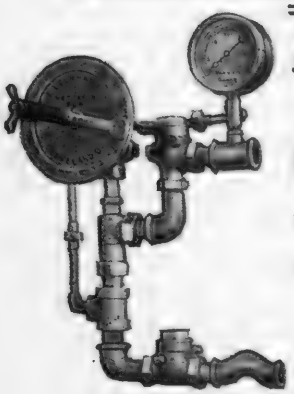

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"He boiled NONPAREIL for 120 hours. After drying the covering was in perfect condition. He then soaked a sample in oil, then placed in a blacksmith's forge for one hour. There was some loss due to abrasion. The canvas was burned off, but the covering was practically all there."

Will any other covering stand up under conditions like these? No wonder such as the City of Cleveland, H. J. Heinz Co., Goodyear Tire and Rubber Co., City of Pittsburgh, National Sugar Refinery, etc., SPECIFY NONPAREIL.

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Branch Offices in the Large Cities

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$72,000; also mechanical equipment for the new building at the State University, the contract amounting to $46,000.

Carthey & Dumbeck, Salt Lake City, Utah, heating and plumbing in 150 workmen's cottages at Garfield, Utah.

J. M. Lettich, San Francisco, Cal., heating, plumbing, gas fitting, etc., for new five-story building at Stevenson and Seventh Streets, San Francisco, for $13,635.

J. J. Hurley & Co., Boston, Mass., heating and ventilating new Beech Street School at Belmont, Mass. Others bidding were: Comonwealth Heating Co., $8,100; Schofield-Campbell Co., $8,328; Isaac Coffin & Co., $8,375; Huey Bros., $8,497; Ingalls & Kendricken, Inc., $8,867; Cleghorn Co., $9,-155. The plumbing contract went to D. F. Keefe at his bid of $2,475.

Joseph A. Langdon & Sons, Pittsburgh, Pa., remodeling steam heating system at St. Vincent's archabbey at Beatty, Pa. A vacuum steam heating system will be installed in twelve buildings, in addition to considerable high pressure steam piping.

Trade Literature

ECONOMICAL STEAM PRODUCTION, a presentation of soot cleaning as applied to all types of water tube and return tubular boilers, with special reference to the Vulcan system, manufactured by G. L. Simonds & Co., Chicago, Ill., is the subject of a new catalogue giving many facts and data on soot in relation to boiler efficiency, many of which have never before been published. One of the interesting statements made is that one-fifth of an inch of soot will stop as much heat as one inch of asbestos. The principle of the Vulcan system is perfect distribution of the steam, so directed and controlled as to clean the entire surface of every tube. For this purpose specially-designed blow pipes are extended across the full width of the boiler, the blow-pipes being either stationary or revolving, and have either perforations at intervals or equipped with special nozzles. Numerous illustrations are included to show the various methods of installation. Size 6 x 9 in. (standard). Pp. 48.

WM. H. BRISTOL ELECTRIC PYROMETERS, for iindicating and recording temperatures as high as 2,000° F., are discussed in detail in a new catalogue (No. 1400), published by the manufacturers, The Bristol Co., Waterbury, Conn. The development of this instrument is told in the introduction which describes the work done by William H. Bristol in improving and simplifying the Le

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For 1913-14

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244 pages, 6 x 9 inches. 105 Illustrations. 20 Tables.

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The first full and authoritative treatise on the art of vacuum cleaning. Contains all of the author's important tests of vacuum cleaning apparatus, history of mechanical cleaning, requirements of an ideal vacuum cleaning system, together with chapters on the carpet renovator, other renovators, stems and handles, hose, pipe and fittings, separators, vacuum producers, control, scrubbing systems, selection of cleaning plant, tests, specification and portable vacuum cleaners.

A Book for Engineers, Architects, Superintendents of Buildings, Heating and Plumbing Contractors and Others Interested in the Correct Design and Installation of Mechanical Cleaning Plants of Any Type.

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Chatelier type of electric pyrometer. The interesting statement is also made that during the last twenty years, the Bristol Company has developed a line of indicating and recording thermometers and pyrometers for ranges of temperature as low as 60° F. below zero and as high as 3,000° F., including several radically different systems of temperature measurement, chief among which are the thermo-electric system, the electrical resistance system, the liquid expansion pressure system, the vapor expansion pressure system and the gas expansion pressure system. Size 8 x 10½ in. Pp. 64, punched for binding.

MARSH ORIGINAL STEAM CONTROL VALVE, made by Jas. P. Marsh & Co., Chicago, Ill., is the subject of special circular matter, showing the latest type of this modulation valve for radiators which has been made by the Marsh company for over 25 years. In its construc-

MARSH STEAM CONTROL VALVE.

tion, the expanding member is of the genuine Marsh composition, reinforced with inner brass tube. The float is corrugated to lessen friction. The valve seat is a ball joint, designed especially to prevent leakage. The valve also has a duplex base, with separate passages for air and water. It is guaranteed for five years' service.

MAIHAK PATENT INDICATOR, fitted with Bottcher's power counter, by the use of which it is possible to ascertain instantly the mean indicated horse power of any reciprocating power unit, whether steam engines, Diesel or other internal combustion engines, gas engines, pumps, compressors, etc., is the subject of a special bulletin sent out by Herman Bacharach, 14 Wood St., Pittsburgh, Pa., American representative for the manufacturer, H. Maihak. Hamburg, Germany. All that is required is to note the reading on the counting appliance at any given moment and to multiply same by the constants for the apparatus and engine respectively. The apparatus indicates every stroke of the engine and thus counts every diagram developed in the cylinder. Successful application is guaranteed up to 400 R.P.M. The circular describes the device in detail and also contains full direction for its use.

KEWANEE FIREBOX BOILERS for steam and water heating are presented in a recently-issued catalogue giving details of measurements and tables of specifications and prices for this line, manufactured by the Kewanee Boiler Co., Kewanee, Ill. Similar data are also given for the Kewanee smokeless firebox boilers. All of the information is carefully arranged for quick reference. Size 6 x 9 in. (standard). Pp. 24.

EUREKA WATER LIFTS, electric and hydraulic, designed especially to automatically supply soft water, or, where electrical equipment is used, to increase the city water pressure to higher altitudes than the normal city water pressure will lift the supply, are discussed in a new catalogue issued by the makers, the Bishop-Babcock-Becker Co., Cleveland, O. Layouts are included illustrating the proper methods of installation for various purposes. Size 6 x 9 in. (standard). Pp. 32.

HEATING THE HOME, describing the Webster modulation steam heating system for residences, with illustrations of an installation in a modern residence, is a recent publication of Warren Webster & Co., Camden, N. J. The illustration shows in detail the arrangement of the boiler and basement piping, with the devices used with the Webster modulation system, in their proper locations. Size 6 x 9 in. (standard). Pp. 16.

WEBSTER VACUUM SYSTEM OF STEAM HEATING FOR MANUFACTURING PLANTS is a recently-issued catalogue received from Warren Webster & Co., Camden, N. J. One of the interesting views included shows the application of the Webster system to a fan system of heating, with connections to radiators, manifold coils, return bend coils and wall radiators. The advantages of the Webster vacuum system for live steam heating are pointed out. The Webster "Hy-Lo" system is illustrated and described, as well as the Webster electro-pneumatic vacuum system. The catalogue concludes

The "Sterling" Air Washer

STERLING TYPE "D" AIR WASHER

Designed with features that are most modern and up to date.

FLUSHING SPRAY HEAD—No Internal Obstructions—NON-CLOGGING.

AUTOMATIC SPRAY CLEANING DEVICE—Operated by Spray Water.

VERTICAL CAM SHAFT TRIPPER—Sprays Flushed in Rotation.

FLOODED BAFFLING SURFACE—VERTICAL—Self-Cleaning—SANITARY.

THERMO-HUMIDITY CONTROL SYSTEM—Instantaneous and Accurate.

The above "STERLING" features are worthy of your consideration when your next specification comes out.

RESULTS—

Low Resistance Thru Washer and Efficient Cleansing

The simplicity of the working parts of The "STERLING" Spray System insures dependability and low cost of operation. Investigation of prices and details solicited. Open territory for well established representatives.

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Also investigate "The Sterling Portable Air-Washer" Type B.
Built in capacities from 100-5000 Cubic Feet/Minute.
For small office suites, residences and lodge halls.

Boiler Copings and Foundation Caps for Motors, Pumps, Fans and Blowers

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It never hardens or sets, and is a perfect preventive of rust and corrosion. Send for Booklet No. 311 on "Pipe Joint Compound."

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Ric-Wil Conduit with Base Drain

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Vitrified Tile made from Akron Clays—best in the world.
"Diatomite" Insulation most efficient by test.
Roller Expansion Bearing for Steam Pipe, simplest and most practical.
Base Drain, large capacity, substantial support for pipe and conduit. You can see it work.

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INSULATING UNDERGROUND STEAM PIPES
Write today for Catalogue "L"

THE RIC-WIL UNDERGROUND PIPE COVERING CO.
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with a description of the company's three types of valves, including the thermostatic plug pattern, the water seal motor and the sylphon thermotor, the latter being the latest type of valve which has been brought out by the company for use at the return end of a radiator or coil. Size 6 x 9 in. (standard). Pp. 24.

COMPRESSED AIR AND ITS COMMERCIAL USES, published by the Gardner Governor Co., Quincy, Ill., is a new catalogue devoted to the company's line of air compressors, including air cooled machines for small installations, such as pneumatic water systems, garages, etc. The Gardner line comprises vertical and horizontal machines ranging in capacity from 2½ cu. ft. to over 600 cu. ft. per minute. One of the horizontal types shown is the Gardner steam actuated machine intended for larger installations, machines of this style being made in capacities up to 600 cu. ft. of free air per minute. Other illustrations show the Gardner horizontal self-oiling air compressor which is described as a model of accurate workmanship and finish. Size 4¾ x 5¾ in. Pp. 40.

STERLING AIR PURIFYING AND COOLING SYSTEMS are detailed in a new catalogue issued by the manufacturers, Blomfeldt & Rapp Co., Chicago, Ill., the illustrations including side and front elevations of the Sterling System and tables of capacities and sizes. In the company's guarantee the washers are credited with a cooling efficiency capable of reducing the temperature of the air at the surface of the eliminator plates to within 15% of the wet bulb depression and of maintaining a normal state of humidity when outside temperatures are above 70° and below 90° F. and 60% relative humidity. The washer has a guarantee air cleansing efficiency of 95%. The catalogue covers both the stationary and portable outfits. Size 6x9 in. (standard) pp. 12.

POWELL UNION COMPOSITE DISC VALVES, made by the Wm. Powell Co., Cincinnati, O., in sizes 1 to 3 in. (bronze) and 2 to 8 in. (iron body) are the subject of circular matter, showing in detail the construction of these devices. This valve is intended for medium steam pressure, hot water or steam heating. Special attention is called to the patented connection between bonnet and body neck, which is a beveled ground face connection secured by hexagonal union nut, insuring a steam-tight joint under all pressures. The hexagonal union nut can be unscrewed indefinitely without rounding the corners caused by the wrench slipping, Acme threads on stem consisting of six threads. These are all in use when valve is closed and are designed to prevent stripping from too strenuous use. The valves are guaranteed to stand a steam pressure up to 150 lbs.

MCNAB & HARLIN MFG. CO., New York, announces, in new circular matter, an addition to its extensive line of high grade "MH" valves. These are in the form of regrinding valves and are made of steam metal to meet the demands of the trade and marine engineers. The body is of the elliptical type, having full pipe area throughout, with heavy hexagon pipe ends to combat the excessive strain in piping up. The circular states that an illustrated catalogue and price list of the full line of "MH" products can be had on application.

SIROCCO SYSTEM OF PURIFYING, COOLING AND HUMIDIFYING is covered in a new bulletin (No. 23) published by the American Blower Co., Detroit, Mich., which, it is stated, is preliminary to a general catalogue and data book the company is preparing on air purifiers and humidifying and cooling apparatus. This bulletin presents a general idea of the construction of the Sirocco System, including plans and elevations, which are now being manufactured by the company under the McCreery patents. The air washers are made in four types, full details of which are included in the bulletin. Size 8½x8 in. Pp. 8.

STURTEVANT EXHAUST HEADS, described as a remedy for rotting roofs and icy sidewalks, are the subject of newly-issued circular matter sent out by the B. F. Sturtevant Co., Hyde Park, Mass. The circular states that full information is contained in the company's MC-19.

WANTED

WANTED—Assistant sales engineer and draughtsman, familiar with sheet metal work in connection with fans, one who is able to measure up and lay out work, design systems for material collecting, to act as assistant to the manager of the fan engineering department. Apply by mail, or in person, to W. B. Crawford, care The A. B. Ormsby Company, Limited, King and Dufferin Streets, Toronto, Ont.

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The following prices will be paid for back numbers of THE HEATING AND VENTILATING MAGAZINE:

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Vol. 5 (1908), Nos. 1 and 8, 15 cents each.

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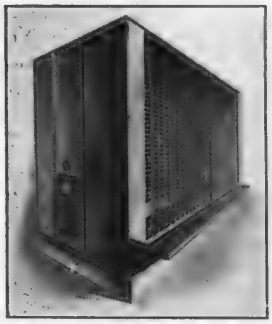
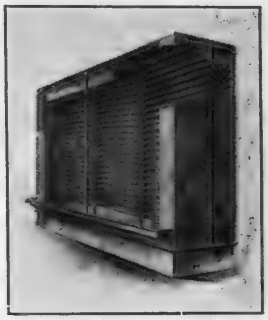


Webster "Type A" Air Washer

Atmospheric Conditions

Affect Nearly Every Industrial Process To Some Degree



Webster "Standard" Air Washer

Almost every manufacturer knows that under certain atmospheric conditions more or better product can be turned out.

Webster Air Conditioning Apparatus properly designed and applied, can be made to maintain the most favorable indoor conditions at all times, independent of outside conditions.

The Webster Standard Air Washer is designed primarily for air cleansing. Its effectiveness, combined with the small amount of floor space required, and its simplicity of operation, make it particularly desirable in ordinary ventilation work. It may be readily arranged for humidity control.

The Webster Type "A" Air Washer is designed primarily for air cooling. The highly efficient mist nozzles which atomize the spray water into mist and fog permit of maximum cooling where the spray water is recirculated with or without the application of refrigeration or the use of cold well water. The Webster type "A" Air Washer is excellent for air cleansing and may be readily arranged for humidity control.

Special Apparatus. Modifications of either of the above types can be furnished to suit the conditions as may be required.

Webster Air Conditioning Apparatus is original in design and application, and represents the most advanced ideas in the art. It is not only the best we can build, but it is the best that can be had. It meets the requirements — the supreme test.

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TO INSPECT
TO REPLACE

SIMS STANDARD "CLEAN E-Z" STEAM TUBE HEATER. Made with straight tubes, easy to inspect or replace

Note the tube structure, consisting of two banks of tubes of equal area, steam entering the upper section and leaving through the lower set. Water inlet in steel head provided with deflector preventing short circuiting.

Provided with large amount of heating surface to absorb all heat in exhaust steam. By addition of special fitting, live steam may be admitted to same tubes.

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THE SIMS CO., Erie, Pa. 18th St.

Reliable Thermostats

Actual Positive Action for Valves
Actual Intermediate Action for Mixing Dampers

JOHNSON SERVICE COMPANY

JOHNSON SYSTEM

TEMPERATURE JSC REGULATION

FIRST in the field — in efficiency — in size.

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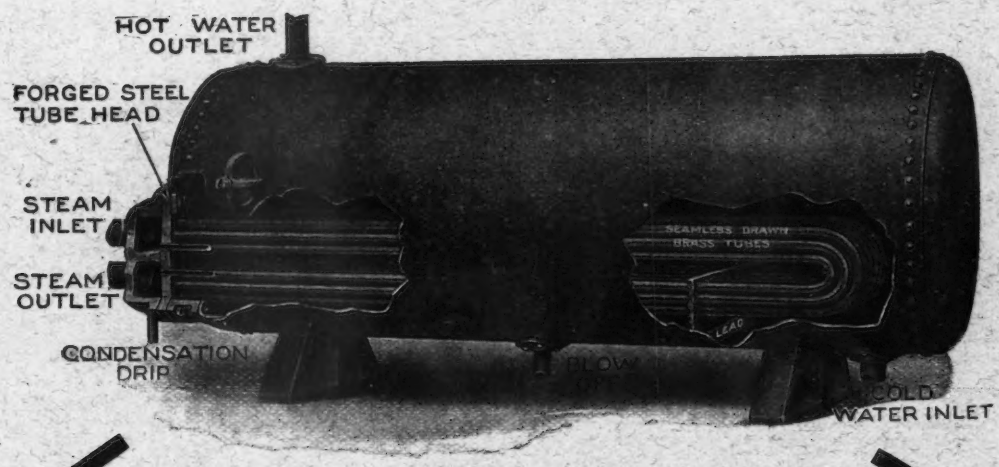
NOTICE—We are the owners of Patent No. 924,235 relating to the automatic control of humidity. Infringers and unlicensed users will be prosecuted.

2 in 1



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HOT WATER HEATER and STORAGE TANK

Both in One Shell

The "U" shaped seamless drawn brass tube heating surface is placed at the lowest point of the tank where the cold water enters, leaving the upper and larger part for the storage of hot water ready for instant use.

Ideal for institutions, schools, association buildings where water is used for showers or wherever sudden demands are made for large quantities of hot water.

Shells of heavy boiler plate.

Tube heads of forged steel.

Any combination of storage and heating capacities can be furnished.

FRANK PATTERSON & CO.

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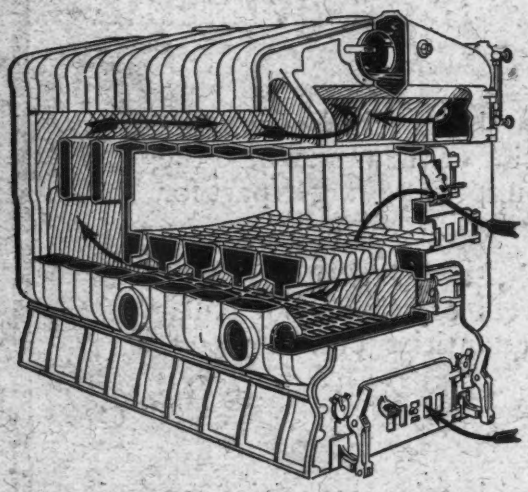
The great popularity of IDEAL Down-Draft Smokeless Boilers is due solely to the remarkable success of these Boilers in operation. These Boilers are really *smokeless*, even when the cheapest free-burning soft coals are used. IDEAL Down-Draft Boilers, do away with the smoke nuisance and make it easy to comply with municipal smoke ordinances; they actually effect a saving of from 10 per cent to 60 per cent in the fuel bills—an attractive investment which easily accounts for the constantly increasing demand for these Boilers.

Ideal Down-Draft Smokeless Boilers



Side of IDEAL Boiler cut away to show by arrows how the air is made to pass down through the double grates to thoroughly mix with the flames and thus produce utmost heating results from cheapest soft coal, just as air is mixed in a modern gas mantle to give greatest light.

are designed especially to burn low-cost free-burning soft coals. They have double grates and a double air inlet supply—*down* through the upper grates and *up* through the lower grates. This insures a proper mixing of the air and gases between the two fires where they are burned as fast as liberated, thus preventing their being wasted up the chimney in the form of smoke, and at the same time getting the highest possible percentage of heat-making value from the cheap fuel burned.

Ideal Down-Draft Boilers are used in all types of buildings from residences to factories. In many localities an examination into the local market price of the fuel and the volume and reliability of the supply, will be found to constitute one of the strongest arguments for the use of these Boilers. Ask for descriptive circular No. 1047.

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